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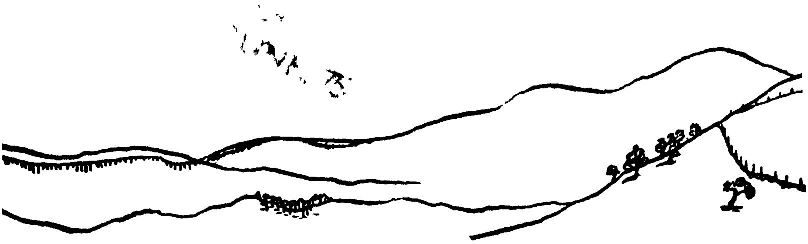

Principles, Problems, and Policies in Utilizing Land Resources

BY

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LAND ECONOMICS

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PREFACE

Land has certain unique characteristics which distinguish it from the other major factors of production and which cause its users to respond in special ways to the stimulation of price shifts or institutional changes. Methods of using land and its share in the national income are therefore determined according to principles whose applications are sufficiently different from those of other production factors to justify separate study. Hence, the social science of land economics, the purpose of which is the formulation of a systematic body of knowledge concerning the characteristics and utilization of land that society may employ in determining allocations and uses that will best serve to achieve desired ends.

The content and arrangement of the subject matter of this book are the outgrowth of nearly two decades of experience in teaching. Part I presents certain definitions and relationships to give the student the essential background and perspectives for a proper understanding and appreciation of the field of land economics. Part II analyzes the fundamental principles of the economic and social processes of land utilization, operating within the system of property rights as construed by the prevailing economic philosophy. These principles are designed to shape the tools by which the problems of land use may be attacked and resulting policies and programs understood. Part III describes the spatial requirements and most important characteristics peculiar to the seven major land uses. These chapters provide the factual basis for a comprehensive understanding of the land utilization pattern and the competition of land uses in producing economic goods and services.

Part IV analyzes the major land use problems of tenure and tenancy, valuation and credit, taxation and conservation, and the policies and programs that have been established or which would be most effective in solving them. These problems have been analyzed in Part IV rather than in the seven chapters of Part III describing major land uses, in order to focus attention and thinking on the *economic and social problems* associated with land utilization. For example, tenure and tenancy problems in utilizing agricultural land are discussed in Chapter XIV, "Land Tenure and Tenancy," along with tenure and tenancy problems of the other major types of use, rather than in Chapter VII, "Agricultural Land." Some contend that land credit and land taxation problems are land tenure problems arising from aspects of human behavior in which property rights in land are the dominant directing factor, just as are tenancy problems. Land credit and taxation problems are so large and significant, however, and courses of study, research, and administration have already been established in these fields, that it seems best to devote separate chapters to these problems.

The last section of the book (Part V) is devoted to an analysis of planning and control of land use in the interests of improving the quality of human living. Far-reaching economic and social changes have recently shaken the very foundations of society, and present new and interesting problems for solution. The content of land economics must be geared to and determined by the efforts of the nation and the world to improve human living, including full employment and higher nutritional levels. Over large parts of the world the mass of the people can improve their lot chiefly by improving their ways of using the soil and other natural resources.

The author wishes to acknowledge the encouragement and assistance of many colleagues, friends, and students in the preparation of this volume. G. H. Craig was particularly helpful in the preparation of the first six chapters. Virgil Hurlburt's critical reading and constructive criticisms of Parts III and V improved these chapters. Oswald Brownlee gave valuable assistance in reading and criticizing Chapters V and VII; Victor Sullam, Chapter IV; Rainer Schickele, Chapter XIV; M. Slade Kendrick, Chapter XVI, and Arthur C. Bunce, Chapter XVII. John J. Haggerty and the late Leonard A. Salter, Jr., made general suggestions concerning the organization and presentation of the material, and Miss Erdine Maxwell assisted in preparing the charts. The author is particularly indebted to John Ise for his careful editing of the entire manuscript and his many helpful suggestions throughout. Finally, I am grateful to Miss Margaret Austin, who prior to her death in May, 1944, assisted in the preparation of the entire first draft, and to her sister, Miss Nancy Austin, for her efficient help in the preparation of the final copy and the mechanics of publication.

June, 1946 ROLAND R. RENNE

PART ONE

BACKGROUND AND PERSPECTIVES

CHAPTER ONE

THE FIELD OF LAND ECONOMICS

LAND AND LIFE

CLIMATE, land forms, and natural resources (soils, water, minerals, natural vegetation, and native animal life) combine to make up the physical environment within which man exists. The basic earth resources are transformed by labor into economic goods and services which satisfy human wants. The great importance of land in determining man's economic and cultural progress is due largely to the diversification, relative scarcity, and localization of its resources. Arable farm land and the most useful minerals, especially, are not distributed evenly over the earth's surface but are highly localized.

Strategic Role of Land Resources. The struggle for political control of raw materials is indicative of the highly localized nature of land resources. Discoveries of new land bodies and new natural resources have been milestones along the path of economic progress and cultural development. The discovery and extraction of minerals is almost always one of the principal objectives in exploration and colonization, because nations controlling the most important minerals can forge ahead and may be better able to wage successful defensive or offensive warfare. Since mineral supplies are fixed and limited, international rivalry grows more intense as their consumption increases. Even if an equitable redistribution of mineral resources were politically possible, it would be physically impossible, because some deposits are unique and others too limited to be divided among the numerous would-be users.

Access to useful minerals and diverse types of arable lands enables industrial and agricultural technology to advance. The encouragement of inventive genius frequently associated with harnessing the forces of nature is a significant example of land's influence on human progress. Nations with relatively favorable natural environment have usually developed greater industrial plants and a more complex technology than have nations comparatively poor in accessible natural resources. For example, Great Britain's rapid development into a world power was caused largely by the industrial and commercial lead it secured while the Continent was engaged in the Napoleonic Wars. This early leadership was made possible by Britain's readily available water-power sites; deposits of coal used in steam engines; limestone and iron ore necessary for making steel; and ready access to the sea, the major transportation medium of the time. The United States, because of her rich, arable lands and large, accessible deposits of the more useful minerals, has made great material progress and is one of the leading powers of the twentieth-century world.

Influence of Land on Culture. The physical environment does not specifically predetermine man's way of living, but it does set certain limits to the development of his activities and institutions. Soils, climate, and mineral resources are highly localized, the amount of arable land suited to the growth of important foodstuffs and fibers varies widely among nations, and such natural conditions as topography, or the amount, nature, and timing of the precipitation, influence not only the technical practices but the people themselves and their entire economic and social organization. If it is to survive over a long period of time, human culture must be in harmony with physical environment.

The physical environment is a major determinant of the pattern of man's economic and social organization in a relatively primitive society, but in highly industrialized societies the physical environment is considerably less influential. This "geographic determinism" does not mean that cultures become exactly alike under similar physical conditions. Rather, it implies that the effect of climate, topography, fertility, and other physical factors upon all cultures will be relatively predictable. A somewhat barren controversy has developed between advocates of "geographic determinism"[1] on the one side and "cultural determinism"[2] on the other. Both schools tend to oversimplify the relationship between nature and nurture, whereas in reality the functioning culture is produced by a mutual adaptation of the two.

The necessity of harmonizing human culture with physical environment may be illustrated by the American experience with western land settlement. The 160 acres allotted to each settler under early homestead policies proved satisfactory in the comparatively humid Middle West, but this acreage was insufficient to support a family in the more arid Great Plains.[3] Allotments were doubled in 1909, and in 1916 a full section was allotted if the land was to be used for ranching. Unfortunately, much of the land had already been subdivided into small, uneconomic parcels. This subdivision and the resulting land system were important causes of such problems as overgrazing, soil blowing, and farm abandonment, which became so acute that in the thirties the federal government inaugurated a submarginal land purchase and development program in parts of the Great Plains, to repair some of the damage caused by earlier land policies and to bring about land tenure and utilization practices more suited to the natural environment. Exploitative cutting and abandonment occurred in the case of forest lands. Thus, American land settlement experience is evidence that climate and land forms are strategic in forcing cultural adaptation.

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[1] See particularly Ellsworth Huntington, *Civilization and Climate,* Yale University Press, 1924, and his other writings; Ellen C. Semple, *Influences of Geographic Environment,* Holt, 1911; R. H. Whitbeck and O. J. Thomas, *The Geographic Factor: Its Role in Life and Civilization,* Appleton-Century, 1932.

[2] See especially Wilson D. Wallis, *Culture and Progress,* Whittlesey House, 1930.

Influence of Culture on Land. Land is not simply an active agent causing cultural adaptation, but is itself subject to rather significant changes. Its face may be lifted and its rough forest profiles transformed into smooth airplane runways or terraced rice paddies. Many man-made land structures become permanent and thereafter similar for economic treatment to the structures laid down by nature originally.

During the last two centuries rapid strides have been made in the use of earth strata unutilized before the development of modern machinery and technology. The subsurface has been made to yield its fossil fuels (oil, gas, and coal) and its metals to make machines which use these fuels. Railroads, automobiles, and trucks have been responsible for many changes in the earth's profile; and water has also come to be more intensively used for various purposes such as irrigation. Development of the airplane, the radio, and the modern skyscraper has permitted greater use of the supersurface (air) for transportation, communication, and other purposes.

Since the use of land is no longer confined to the earth's surface, area and acreage have become less dependable measures of the total economic supply of land. These changes, with the development of technology, have increased the economic supply of land far beyond earlier potentialities in most lines of production. Improved transportation and production methods accompanying the application of science and machine technique to mining, manufacturing, and agriculture have made available land which was formerly useless because of its inaccessibility or inferior quality. Land now responds much more readily to increases in demand for its products with increases in the amount of land available.

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[3] The Great Plains area is, roughly speaking, that section of the United States lying between the 98th meridian and the eastern edge of the Rocky Mountains.

Agricultural land use in modern technological, commercial economies is much more complex than that in a simple hand-labor, animal-energy economy. Non-agricultural uses are even more numerous and complex, competing for land not only with agriculture but also among themselves, though they are closely interrelated. Modern society is characterized by the expanded, accelerated use of natural resources to satisfy human wants. Study of the principles governing the economic utilization of land is, therefore, increasingly important.

LAND ECONOMICS AS A SOCIAL SCIENCE

Man's attempt to appropriate land for his use and possession is the subject matter of land economics. Only when land becomes scarce do economic problems arise. So long as land is relatively abundant, as it is under primitive conditions where population is small and soil use unspecialized, serious difficulties will probably not occur. The early nomad did not bother to appropriate any part of the lands grazed by his flocks, as long as he was sure that in his wanderings he could always find the needed pasture. But as the land was tilled and used more intensively to satisfy the wants of a growing population, the right to use certain lands became more valuable and more fiercely contested. Scarcity of land with desired production or location qualities, and use of human labor and accumulated capital goods to produce food and fiber from the tilled acres, necessitated the establishment of certain individual legal rights of ownership or property in the land.

Land economics focuses attention on situations and problems in which the use of land is the *strategic, limiting,* or *decisive* factor. Since land could not be a limiting factor if it were superabundant, and since property in land would not exist under such conditions, the problems with which land economics is concerned are those associated with the institution of property in land. Property governs men's relations to one another in utilizing land.

Study of economic problems in land use is not an end in itself but a means to determine principles and methods by which human welfare may be increased. This betterment of the conditions of living is the standard by which all policies and programs of land utilization, public or private, should be measured.

Definition and Scope of Land Economics. Land economics deals with the problems of cost, price, value, income, and use-control aspects of utilizing land as a factor in the production of economic goods and services. It has been said that all human creation is basically re-creation and all production re-production. Producers of economic wealth do not make anything completely new, but perform a process of "extraction" and "conversion" reworking the basic element, land, into useful things ("wealth"). Land, which is defined as the basic natural earth resource, is transformed into usable, want-satisfying goods through the efforts of agriculture, industry, and commerce.

Land economics deals with economic problems involved in utilizing soils, forest, minerals, water, topography, and climate for production of food, fuel and fiber, lumber, metals, recreation, irrigation and drainage, location sites (dwelling, business, and industrial sites), and transportation. Most land economists have been trained in the field of agricultural economics, and have, therefore, devoted most of their energies to determining principles and solving problems applicable to farm and ranch lands. *Agricultural land economics,* like farm management or agricultural marketing, may be considered a subdivision of agricultural economics; but the full scope of land economics is a distinct, applied field of the parent discipline—economics.

Land economics, even when limited to consideration of agricultural land utilization, is clearly distinguishable from farm management, although the two fields are not mutually exclusive. In farm management, the strategic or limiting factor is *management,* while in land economics it is *land,* either because of its natural qualities of location and fertility, or because of the institutions or behavior patterns established to govern its use. Farm management focuses attention on the management problems of an individual firm, and the choice of enterprises for a farm or ranch, or group of farms and ranches. Land economics considers especially how the individual firm affects land use and how it affects groups using or interested in the land. The problems with which the farm management economist is concerned are the individual farm operator's decisions with respect to alternative enterprises—such as grain or livestock production. The land economist is interested in community, state, or national problems, such as tenancy, land taxation, foreclosure, and soil depletion. The institution of property in land is the focus of attention in land economics since it determines the major relations of man to land, and since most of the problems of land economics are intimately connected with the exercise of property rights as construed by the prevailing economic philosophy.

Recent Interest in Land Economics. The subject of land economics is a comparatively new one in American college and university curricula, and in the thinking of agricultural and business leaders.[4] The Division of Land Economics in the United States Bureau of Agricultural Economics was established in 1918, but not until the thirties were soil conservation, resettlement and rehabilitation, agricultural adjustment, subsistence homesteads, county agricultural planning, farm tenancy reform, control of floods and water facilities, and related legislation made a part of our national program. Each of these is primarily concerned with working out better economic relationships between man and land to make possible a more permanent and satisfactory American agriculture, industry, and level of living.

This increased interest in land economics is the result of forces operative during a considerable period of our history—forces which have brought about land use problems so acute and spectacular that serious public concern has been aroused. The American policy of quickly transferring the public domain to private ownership resulted in rapid settlement, speculation, and widespread resource exploitation. The increase of absentee ownership and tenancy associated with speculation and finance capitalism increased the tendency to wasteful, planless exploitation of natural resources. Feverish business activity and high prices in the First World War period postponed the conservation movement begun in Theodore Roosevelt's administration after the disappearance of free land and the devastation of much of our wildlife and forest land; and the industrial and technological expansion and investment speculation of the postwar twenties, in spite of widespread agricultural depression, further postponed it.

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[4] In a survey, made by the author in 1940, of 44 state agricultural colleges and state universities, 37 were offering at least one course in land economics. The distribution of these 37, by periods in which their first land economics course was offered, is: Prior to 1930, 11; 1930–1934 inclusive, 12; 1935–1940, 14. Thus 26 (nearly three-fourths of those offering land economics courses) offered a course for the first time during the thirties.

However, dust storms in the West, floods in the East, serious long-time disparities between farm and non-farm prices, loss of foreign markets, heavy mortgages, high interest rates, and excessive taxes have recently made us more conscious of the harmful effects of soil erosion and rapid resource exploitation. The business depression of the thirties and the efforts to reduce unemployment further encouraged public activity in the improvement of land use practices and in the development of sound conservation methods. The progress made along these lines just prior to the Second World War which began in Europe in September, 1939, was an important factor in preventing a duplication of the rape of our natural resources, particularly agricultural lands, that occurred during World War I.

These causative forces and events will be considered more fully in the chapters that follow. The general approach of the science of land economics to the solution of the problems growing out of these forces and events is briefly sketched in the following section and discussed in more detail in Part IV.

LAND AND ECONOMIC PROBLEMS AND POLICIES

Basic Economic Problems. The use of land, like the use of other economic goods, is subject to economic forces such as those of supply and demand. Land has certain unique characteristics which distinguish it from the other major factors of production and cause it to respond in special ways to the stimulation of price shifts or institutional changes. Two such characteristics not common to the human element or to capital in production are permanence of land and its fixity in space. The method of using land and its share in the national income are therefore determined according to principles whose applications are sufficiently different from the other production factors to justify separate study.

These differences in the response to price or institutional changes give rise to serious problems. Should income from land be taxed differently from other income? Does land ownership give the owner peculiar monopolistic control, because of land's non-reproducible nature, the scarcity of certain kinds of land, and the lack of substitutability among individual parcels? Answers to these questions involve careful study of the characteristics of landed property and the particular economic system within which it operates.

American public and private land use policies have developed in a commercialized price economy where the principle of specialization and division of labor is generally accepted and applied. Land resources are used to produce want-satisfying goods and services in an economic environment dominated by private enterprise and production for sale and profit.

The price system gives rise to many land utilization problems that would not occur in a more primitive, self-sufficing economy. Land economists are concerned with prices because land use is determined largely by the market price of the products of land and the costs of producing them. Price fluctuations create many land utilization problems. For example, if prices of farm products decline rapidly, the farmer must adjust his costs of production, among other things, in order to survive. The two major means of adjustment for the farmer are tightening his belt or taking it out of the soil. He may reduce his level of living, as a means of reducing costs of production, but frequently this is not enough. Some other approach must then be made to the problem of living within his reduced income. Too often the adjustment takes the form of "mining" or exploiting the soil. For example, a farmer may apply insufficient fertilizer or till inadequately, allowing undue decline in fertility, spread of weeds, expedited erosion, and soil blowing. Price changes are therefore extremely significant in land economics, since price disparities between things bought and things sold often cause those who utilize land resources directly to mine them through ill-adapted, shortsighted practices.

Property rights ill adapted to the general welfare are often responsible for exploitation of land resources. A notorious case is that of allowing separate drilling of oil wells by different owners into a common pool. The race to obtain the most oil first drains supplies much more quickly than the relative needs of present and future would make desirable.

Land economists try to discover and explain why and how these situations develop, with the purpose of assisting individuals and agencies in the formulation of policies and programs which will bring about better use of land resources and a higher level of general welfare.

Policies and Programs. A *policy* is "a specific plan of action, or method of achieving desired ends, followed for a considerable period of time."[5] The "desired ends" in land economics are to develop the principles of land use and appropriation as a means to improve the economic and social conditions of living. Land policies, public or private, form the field of operations within which individuals plan land use; and one of the functions of land economics is to analyze these policies and the principles upon which they are based, to determine whether they are the most consistent or the most feasible means of achieving the goals of maximum welfare.

The land policy of a nation is "an evolutionary growth in which politics, ambitions, fears, prejudices, traditions, beliefs true or untrue, and myths each and all have an influence."[6] Physical factors such as soil characteristics, topography, and humidity; technological inventions and developments; biological factors such as improved varieties of plants and better types and breeds of animals; economic and political factors such as taxes, import duties, export subsidies, tariffs, nationalism, and self-sufficiency—all assert their influence on a nation's land use policy, some working together, some against each other. The resulting policy is formed by an intricate mosaic of factors.

Current phases of a land policy are more properly termed *programs*. Reference to "programs" is usually to immediate events, plans, or institutions which are the contemporary manifestations of the longer-time, more fundamental policy.[7] Land use programs, in other words, represent current efforts designed to achieve the objectives implicit in the prevailing land policy. They are the means by which the policy is translated into action. They include efforts of private and public agencies to set up rules and administrative procedures for achieving immediate goals.

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[5] The term *policy* in its most comprehensive meaning has been defined as implying "a more or less carefully considered and fundamental course of action followed consistently for a period of years." (See John D. Black, "The Problem of Determining an Economic Policy for American Agriculture," in E. A. Duddy (ed.), *Economic Policy for American Agriculture*, University of Chicago Press, 1932, p. 1.)

[6] A. G. Black, "Agricultural Policy and the Economist," *Journal of Farm Economics*, vol. XVIII, no. 2, May 1936, p. 311.

[7] *Ibid.*, p. 312.

The great number of federal, state, and local agencies engaged in land use and land adjustment programs have created a large body of rules, interpretations, and administrative procedures, often conflicting and contradictory, which make it somewhat difficult to determine at any time the fundamental land use plan or policy of the nation. It is important that the student distinguish clearly between the terms "policy" and "program" in land economics. Unless otherwise indicated, the term "land policy" will be used in this text to designate the more permanent, long-time guiding principles governing land utilization practices. "Land programs" will be used to characterize current procedures used to implement and attain the land policy.

The land policy of the United States up to the turn of the century was primarily one of transferring the public domain to private ownership as quickly as possible and leaving desirable adjustments to be worked out by the forces of competition. Little consideration was given to the uses for which lands were best adapted, or to the effective demand for products of the land. This policy, together with fundamental economic and social changes in the nation which became apparent after the First World War, necessitated corrective action, either on the part of government or through more unified private initiative. Congressional legislation passed "to do something for agriculture" or "to place agriculture on a basis of economic equality with other industries" has involved a reconsideration of our use of land, particularly agricultural land. Soil erosion, dust storms, and the simultaneous decline of foreign markets and increase in domestic agricultural output have strengthened the land resource conservation movement. The land-use policy of the United States has gradually become one of improving methods of utilizing land resources so as to maintain and improve soil fertility and productive capacity. It is now felt that an adequate land policy must provide not only for the preservation of soil fertility but also for the directed adjustment of production to demand, the economic utilization of marginal lands, and the maintenance of a balance among the various segments of the economy. Action programs will be designed to attain these objectives.

The chapters immediately following analyze the principles of the economic and social processes of land utilization. These principles are designed to shape the tools by which the problems of land use may be attacked and resulting policies and programs understood.

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PART TWO

PRINCIPLES OF LAND UTILIZATION

CHAPTER TWO

THE SUPPLY OF LAND

THE utilization of land as well as that of other goods is subject in a general way to economic forces such as those of interplay of supply and demand. However, the conditions of supply and demand are not exactly the same for each of the factors of production, nor do they operate in precisely the same manner to determine land income or rent as they do to determine labor income (wages), capital returns (interest), or management income (profits).

In order to develop mature judgment concerning the response which land and land users will make to the stimuli of price, property, or administrative rulings, students must acquire a knowledge of the physical supply of land and, more important, an understanding of the characteristic economic responses of land and land suppliers.

SUPPLY ASPECTS OF LAND IN PRODUCTION

Physical and Economic Supply of Land. The supply of land considered in a strict physical sense consists of the whole earth—its land surface and subsurface, water areas, and atmosphere. The total physical supply of land on the earth, therefore, may be considered fixed and limited. Another aspect of land supply is of greater economic and social significance than absolute physical supply. This is the economic supply of land which may be defined as the schedule of land units which will enter particular uses in response to price at a given time and given places. For certain purposes a supply function will be used to denote the response of land to other factors than price, such as government rules and regulations, subsidies, or other forms of stimulating the use of land.

The potential economic supply of land—all land which might possibly or ultimately be used for any purpose—differs from total physical supply because, for some uses to which man could put land, as far as physical possibilities are concerned, certain lands will never be economically desirable or suitable. In other words, the entire physical supply of land may not be economically available or usable for certain purposes, either now or at any time in the future. The present economic supply of land—that which is now being used for all economic production—reflects current utilization practices and takes into account current economic availability and adaptability for specific uses. It represents the economic response to demand for land under existing cultural and technological conditions.

A complete inventory of the world's physical supply of land resources cannot be presented. Many mineral deposits of great value to man no doubt have not yet been discovered. In many parts of the world, moreover, land resources have not been carefully surveyed to make possible any adequate inventory or classification of existing physical resources. To make a complete inventory of present economic supply, it would be necessary to outline the areas now used by man for various purposes. Although data showing physical resources, together with present land utilization patterns, are helpful in giving the student of land economics some understanding of existing relationships between man and land, it is more important for him to have a clear understanding of the man-land relationships which determine present economic supply for each of the uses to which land is put. By the term "supply of land," therefore, will be meant the present economic supply for each use—that is, the economic supply currently available for agriculture, forestry, recreation, mining, transportation, and urban uses. This meaning of "supply of land" takes into account the influence of both physical and human factors upon the availability of land when used for these various purposes.

Elasticity of Supply of Land. In the present largely capitalistic world, owners and users of land decide the type and intensity of use according to the price which the land will bring in the market. If the demand for grazing land is such that a high price can be paid for its use, many acres will enter production which otherwise would be too far up the mountain or too poorly covered with vegetation to be used profitably.

The elasticity of supply of land for any particular use or combination of uses is determined in large part by scarcity, fertility, and accessibility. Since the supply of land, from the economic standpoint, reflects the relationship between the amount of land available and its price, this is a response relationship which land owners have in making their land available, both in the aggregate and for alternative uses according to various reservation prices.

Land may have no supply price to the extent that it is a permanent factor. For short periods, scarcity and reservation prices of owners are the only determining factors. When possible alternative uses of the land exist, they influence the supply prices that will be established. For example, in depleting or conserving crops, shifts in supply will occur only when either: (1) some change occurs in land owners' ideas with respect to future prices or profits, or (2) when new knowledge or technological developments occur which affect the supply of the land itself.

The demand for land rises from the various direct and indirect uses to which it can be put. Direct uses include those in which land itself is a consumption good, such as utilization for recreation purposes or home sites. Indirect uses include those in which land is used as a means of producing goods and services to be used in industry or for final consumption. In the latter case, the demand for land is a *derived demand* which springs from the demand for the goods and services produced, including food and fiber. The demand for land is the schedule of the amounts of land which users will take at varying prices. Shifts will occur with any change in the basic demand for the goods and services derived from land utilization or when any changes occur in prices of these goods and services. Shifts in the demand for land may also occur when any change comes in the market for the other factors of production—capital, labor, or entrepreneurship, either through price changes or through innovations. Innovations are largely ones which cause a change in the substitutability among the factors.

Improved methods of transportation, farming, factory and home construction, and trade and exchange make available for profitable production and use land formerly unprofitable and therefore unused because of inaccessibility or inferior quality, or make land already available more accessible or more productive.

With primitive techniques of production, transportation, and trade, physical conditions are highly important in determining land use. In a modern nation, such as the United States with its mineral-using industries, well-developed transportation system, and widespread application of machine technique, land economically available for use is far in excess of current human requirements for many of its products. The same physical resources from which the native Indians produced so little now produce tremendous quantities of food and fiber products, as well as huge quantities of minerals and mineral products. Irrigation has made land productive that was formerly unfit for crop production. Development of hybrid corn has increased the yield of corn, which has the same effect as increasing the supply of corn land. The supply of land has been further increased through reclamation, drainage, leveling, regrassing, and other means.

Man has so modified the effects of climate or the conditions that control land utilization, that areas once relatively uninhabitable or unproductive except for very limited use have been made fruitful and pleasant, and the supply of land has again been increased.[1] When mining was on a small scale, selective basis, richness of ore deposits was an all-important factor; but nowadays the exploitation of relatively lean or poor-grade mineral deposits is possible because of the opportunity of applying greater doses of capital under modern technology. Leaner or poorer deposits may produce a larger profit than the richer deposits which do not permit an equal degree of intensive capitalistic development. Oil refining is a good example.[2] Thus, availability and applicability of capital are of paramount importance in modern times and land is not as serious a limiting factor as it once was. Land supply has been made more elastic. When no alternatives are available the supply curve is inelastic.

Economic Response of Land to Production. While the influence of natural characteristics in determining the land supply available has declined, temperature, moisture, topography, and soils, often referred to as "the four physical frontiers of agriculture," still determine the absolute limits of cultivability or physical productivity for agricultural land. However, these physical factors now operate less directly, since their influence has been overcome, within limits, or so taken into account that only ultimately do they determine production. These physical frontiers indicate the limits of agricultural potentiality, but the extent to which agriculture is actually practiced depends on the state of societal and technical arts, population pressure, standards of living, and related economic factors.[3] For example, while one acre in ten of the world's surface acreage is physically suitable for wheat production, this tenth greatly exceeds present human requirements, and less than one acre in ten of this physically adapted supply is now being used for wheat. Moreover, since other crops such as corn, oats, hay, and vegetables must also be grown on land suitable for wheat, "it appears unlikely that over three percent of the world's land surface will ever be devoted to wheat production."[4]

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[1] Frost or storm warnings broadcast over the radio to help farmers protect their crops or livestock serve as an example of modern techniques which help to overcome climatic hazards.

[2] Erich Zimmermann, *World Resources and Industries*, Harper, 1933, p. 77.

Technological development of a nation is an important determinant of the extent to which physically adapted supply will be utilized for economic production. In China, for example, less than a third of the acreage physically suitable for crops is cultivated, in spite of a large population, but some 40 per cent is so used in the United States. On a per capita basis, then, from five to six times as much land is cultivated in the United States as in China, or about eight acres per capita in the United States compared with two and a half acres in China.[5]

In China, only the very best lands can be worked because poorer lands will not yield enough to sustain life, under hand-labor methods. Where animals are used as a source of energy, they use as feed a considerable portion of what they help to produce. Use of modern machinery reduces the amount of land required for food and feed production, so that a profit may be made even where less productive lands are utilized, while under hand-labor conditions there might not be a sufficient margin of yield over and above that required to support the hand laborer's family.[6]

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[3] Zimmermann lists some of the corrective arts which man has developed to overcome or at least modify the effects of physical limitations in agricultural land use, as follows: (1) temperature conditions—plant breeding to produce quick-maturing varieties, ensilage to turn immature corn into useful feed, mechanical devices to speed up farm work and thus make agriculture possible in regions where the growing season would otherwise be too short. (2) Moisture conditions—alternating summer fallow and cropping in semi-arid regions (that is, using two years' moisture supply for each year of crop), irrigation, drainage, and selection of drought-resisting varieties like Kafir corn or grasshopper-resisting plants like sorghums. (3) Topographic conditions—terracing, contour plowing, goat and sheep pasture. (4) Soil conditions—improved cultivation, improved agronomic practices (particularly crop rotations), increased availability of fertilizer materials, and improved knowledge of bacteriological factors in soil behavior. (*Ibid.*, p. 86.)

[4] O. E. Baker, "The Potential Supply of Wheat," *Economic Geography*, vol. I, no. 1, March 1925, p. 31.

[5] Zimmermann, *op. cit.*, p. 88.

Use of machine energy leads to agricultural surpluses, and consequently to trade and to cash crops or saleable animal products; that is, exchange economies develop an agriculture resting on a more commercialized, profit-seeking basis than that in hand-labor, locally self-sufficing economies. Cultivation of the soil in commercialized economies tends to be more impersonal and exploitative than that in a hand-labor, self-sufficing economy, and this tendency may have serious consequences for the soil itself. The elasticity in the amount of land which will be used, or respond to production, will vary more in a commercialized economy where business activity, purchasing power, and related economic conditions vary considerably in different periods. These variations cause significant variations in the amount of land actually utilized for production (the economic response) and in the physical supply suitable for such utilization.

Thus, while the physical properties of land are directly related to the economic supply of land, the relationship is not fixed, but is constantly in flux. Increases in population ordinarily tend to increase demand, while changes in the technique or art of obtaining products or services from land usually tend to increase the supply. If chemists should ever discover an economically feasible process for the manufacture of food in test tubes and laboratory, the economic supply of agricultural land might conceivably become unlimited.

INCREASING THE ECONOMIC SUPPLY OF LAND

The limits of the economic supply of land in a price economy at any given time are set by the ratio between the price of the product and the cost of overcoming certain physical obstacles in production. Thus, the decline in value of agricultural land in the United States, beginning in 1920, reflected the increasing economic supply of land due largely to increased efficiency of agricultural production and decreasing price of agricultural products.

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[6] In the United States, increased use of the tractor and automobile and substitution of gasoline and tractor fuel for horse power has released between 35 and 40 million acres of crop land since 1918 to produce commercial crops, or the equivalent of some 10 per cent in effective crop acreage, "effective" being used in the sense of "available for human consumption." It has been estimated that some 85 per cent of the total energy used in the United States economy is now derived from the fossil fuels (coal, oil, and natural gas), and that only about 3 per cent of the amount of energy realized from these mineral fuels is spent in mining, refining, transporting, and otherwise making them available for use. For a more detailed discussion of the use of fossil fuels as a source of energy in the American economy, see Harper Leech: "Plenty—Can Man Have It Without Paying for It?" *University Study Booklet No. 8,* Modern Problems Series, American Educational Press, Columbus, Ohio, 1933.

The economic supply of land may be increased in six important ways.[7] (1) New areas previously unused can be brought into production, constituting an extension of the land used. (2) Areas in use can be utilized more intensively—that is, more labor and capital can be applied in a given area to increase yields and production. (3) Certain drawbacks or hindrances to complete or fullest possible use of the area already utilized may be removed, thus permitting greater output. This is "economizing land utilization," or using the land more economically. (4) Consumption of products of the land may be controlled so that people will desire what the earth can produce most readily. (5) A decline in the population or reduction in the rate of increase may be encouraged and effected through use of birth control or other devices. (6) Foreign trade may be controlled so as to reduce exports of agricultural and industrial products to other nations or increase imports of such products from abroad, thus increasing the economic supply of land within a given nation. Obviously, this method would be ineffective for the world as a whole, but it does cause significant shifts in land utilization and in the economic supplies available for various uses in specific parts of the world.

Extension of Land Area Used. The principal areas of great natural resources as yet undeveloped are: (1) the tropics, (2) the temperate zone outside the range of present intensive development, (3) the arctic, and (4) the sea. The tropics, which may be defined as the areas of the earth approximately within the boundaries of the isotherms of mean annual temperature of 25° C. or 77° F.,[8] contain half the arable land of the world and are rich in undeveloped natural resources but, for the most part, are not now suited to permanent occupation by the white race. Though colored races are able to live in the tropics, they have been backward in developing the natural resources. Nevertheless, the fact that Java and Madura,

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[7] Ely and Morehouse mention the first four of these methods. (See R. T. Ely and E. W. Morehouse, *Elements of Land Economics*, Macmillan, 1924, pp. 63–67.)

[8] Isaiah Bowman (ed.), *Limits of Land Settlement*, Council on Foreign Relations, 1937, p. 381.

Puerto Rico, and some other tropical areas now support a population relatively large in comparison with their land area is evidence that other parts of the tropics may eventually be made to support comparatively large populations. Java and Madura, which have a total area only slightly smaller than Montana, have a population of more than 42 million compared with about a half million in Montana; and Puerto Rico has a population density of 520 per square mile.

Perhaps the best example of an area awaiting development within the temperate zones is northwestern Canada, which contains large areas of excellent soil, comparatively rich deposits of valuable minerals, and abundant water power resources. However, better prices of minerals and food and improved transportation facilities are the two main requirements for increased utilization of these land resources. Many undeveloped lands in this area require drainage, irrigation, or clearing before they can be used effectively for agriculture; and the distance from railroads is so great as to make any intensive form of agriculture impracticable. To use another example, the Trans-Siberian Railway has made possible the use of a strip some 50 to 100 miles wide across Asia for agricultural purposes, but the surrounding land is commercially non-existent, though much of it is physically suitable for agricultural use and contains relatively rich deposits of certain minerals. Until mineral and food prices reach a level high enough to repay the cost of constructing additional transportation facilities and related production costs, these areas will remain undeveloped.

Expeditions to the relatively unexplored polar regions have recently indicated great potential food and mineral resources in the arctic and antarctic. The sea is a potential source of food; and in addition to fish and other sea foods, certain minerals and products such as iodine, salt, or even gold may be recaptured from oceans or other bodies of water. Bowman, in *The Pioneer Fringe,* defines the remaining areas considered as "pioneer" areas as "regions of potential settlement in which man may have a reasonably safe and prosperous life, but regions in most of which he is required to make certain special adaptations."[9] These adaptations are many and varied. In some cases, adaptations to very cold or very hot climates must be made through plant and animal breeding. In arid regions,

[9] Isaiah Bowman, *The Pioneer Fringe,* American Geographical Society, Special Publication 13, 1931, p. 51.

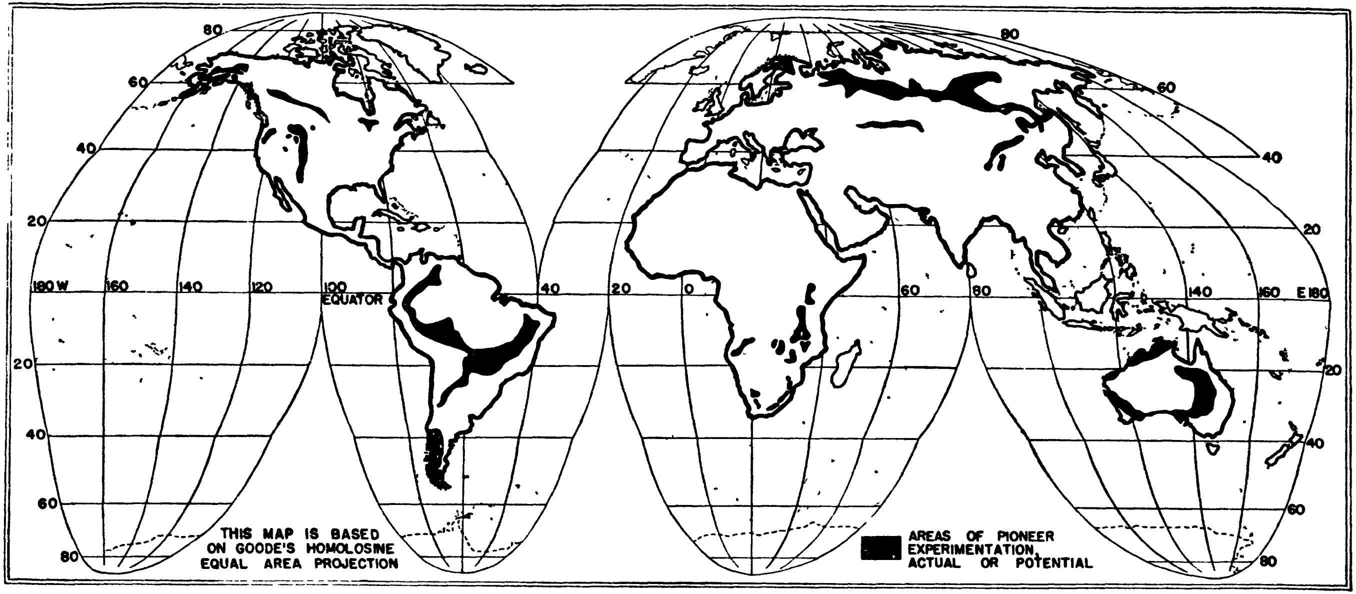

FIGURE 1. Pioneer Belts of the World. (Adapted from Isaiah Bowman, *The Pioneer Fringe,* American Geographical Society, Special Publication 13, 1931.)

drought-resistant varieties must be established or irrigation must be developed. In other areas, insect pests must be controlled to the point where they are not too destructive, or swampy lowland strips must be reclaimed through drainage, or a too porous soil may be a factor which man must contend with before he can efficiently utilize the area. In any case, remaining areas of undeveloped natural resources do not constitute a broad, unbroken belt, but rather "a series of scattered patches and strips loosely disposed in belt-like form beyond the fringe of present settlement,"[10] each continent having its share (see Figure 1).

On the continent of North America, pioneer belts include a strip of land lying roughly along the 100th meridian in the United States, and a considerable portion of Alaska and Canada extending from the prairie provinces eastward across northern Ontario and parts of Quebec. In Asia, much territory is included on each side of the belt of settlement that has followed the Trans-Siberian Railway, and much of northern Manchuria and Inner Mongolia is included (refer to Figure 1). Arable sections in this area have been settled rapidly in the last two decades.

There are large pioneer areas in Australia, Southern Africa, and the continent of South America, particularly in Patagonia, on the plateau of Mato Grosso, and in Brazil, Bolivia, and other regions on the eastern slope of the Andes. Remaining pioneer lands are chiefly in areas of deficient and less reliable rainfall. Scientific study of such climates would permit man to plan land use adaptations to fit the basic environment most efficiently. Much study is required if land is to be most fully utilized and its highest possibilities realized; and certainly the experimental type of land on the pioneer fringe requires even more study. Just how effective these pioneer areas will be in satisfying man's demand for land remains to be seen. Economically they are now relatively unimportant; physically they constitute a large area of great potentialities, and their future will depend largely upon demand for the products of land resulting from population trends and standards of living achieved, and on the advancement of science, which will make possible efficient utilization of these areas.

More Intensive Utilization of Land Resources Now in Use. Improved management and large applications of capital and labor result in more food and fiber being produced per acre, and fewer acres will do the same work more acres did before. In other words, the same number of acres will support a greater population. It has been estimated that if the United States increased the yield per acre of all its principal crops except corn and cotton to a level equal to those in Germany before the First World War, and if corn and cotton yields remained constant, United States agricultural production could be increased approximately 33 per cent above that of the early 1920's.[11] Stated differently, this increase in yield applied to our present arable acreage would feed some 166 million people, and applied to both our present and potential acreage of arable land in the United States, would yield enough for 250 million.[12] It has also been estimated that if we were to use improved pasture lands in the United States for crops, production would be doubled on these acres, and the net increase would be equal to an increase of 37 million acres of crop land or a 10 per cent increase in our acreage of harvested crops.[13] Other sources have indicated that if the average yield of staple crops were raised to a standard attainable without great changes in the forces involved, present crops might be grown on an acreage a third less than that at present required.[14] This would necessitate growing crops in soils especially adapted to them, and using better tillage methods, more scientific rotations, and proper fertilization.

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[10] Bowman, *loc. cit.*

There has been a great deal of waste in the utilization of all our major land resources. More intensive and efficient utilization would produce a larger proportion of minerals from ore bodies, a larger amount of finished lumber and wood products from our forested acres, and increased agricultural output per acre. In urban areas there is, in the aggregate, considerable land plotted for city use but unused for urban purposes because the cities have not yet grown sufficiently to create an effective demand for it. During the First World War, much of this idle land was used for gardens, and it has been estimated that food products valued at 525 million dollars were added to the normal production by utilizing such lands.[15]

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[11] See O. E. Baker, "Land Utilization in the United States: Geographical Aspects of the Problem," *American Geographical Review*, vol. XIII, no. 1, January 1923, p. 14.

[12] *Ibid.*

[13] *Ibid.*

[14] Ely and Morehouse, *op. cit.*, p. 65.

[15] *Ibid.*

Systematic crop rotations, using soil-building crops (crops that improve tilth), legumes, and grasses to retain soil and food productivity, are not only effective in soil conservation but appear to increase yields of corn and oats in the corn belt from 10 to 15 bushels per acre—as much as 15 or 20 per cent.[16] Substituting higher-quality legumes for other hays results in increased tonnage and higher feed value from the same tonnage. Contour tillage (farming around the hill or slope, on the level) not only controls erosion and conserves moisture but increases yields.[17] Experiments in applying lime and phosphate to pastures indicate that an application of 16 per cent superphosphate at the rate of 300 pounds per acre once every three years, combined with lime according to soil needs, would increase livestock carrying capacity of pastures about one-fourth, in the eastern and southern United States.

Use of certain soil amendments in the form of chemicals and soil elements vital to plant growth has increased yields per acre considerably. Many plant diseases have been traced to deficiency of certain soil elements. Lack of magnesium may cause sand-drown of tobacco or chlorosis of tomatoes, while adding zinc to the soil and using it in orchard sprays remedies pecan rosette, peach littleleaf, and similar diseases. Recent studies show that crackstem of celery, internal cork of apples, and several other diseases can be controlled or prevented by adding small amounts of boron to the soil.[18] Application of such soil amendments results in greatly increased yields, as well as improved quality.

More intensive farm woodlot utilization, and the shift in the South to pulpwood production for the paper industry, has greatly increased the annual forest product yield per acre. Extensive forest fire and insect pest control by the U. S. Forest Service has increased the growth of high-quality, valuable timber on public forest lands. Yields of forest lands in such countries as Germany, where more intense utilization has been developed, indicates the potential increase in output possible under such conditions.

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[16] E. E De Turk, F. C. Bauer and L. H. Smith, Illinois Agricultural Experiment Station Bulletin 300, 1937, Table III.

[17] In a short test in one area, contour farming boosted corn yields from 5 to 23 bushels per acre, and it was estimated that probably about 15 million acres of corn grown annually on sloping land in the western corn belt in the United States could be farmed on the contour. It is estimated that a concentrated program of contouring in the western corn belt could provide an increase in corn production of about 50 million bushels. (See *Technology on the Farm*, Government Printing Office, August 1940, p. 29.)

[18] *Ibid.*, p. 31.

Use of more efficient machinery in extracting minerals is another example of increased output made possible by intensification. In certain United States gold-producing areas placered many years ago and abandoned, large modern dredges have extracted gold from the same land previously panned by hand.

One of the boldest of twentieth-century technical plans to intensify utilization of previously used land by the application of great doses of capital, labor, and management is the plan referred to as "Antleuropa," evolved by a Munich architect. This plan would convert the Mediterranean into an inland lake in order to utilize part of its water power for productive purposes and reclaim much land along its European and African shore lines for agricultural and urban use.[19]

Although the preceding examples indicate ways in which more intensive land resource utilization can result in increased production so that fewer acres are needed to support the same population, or so that acreage can support a larger population, this intensified utilization—whether applied to agricultural, forest, mineral, recreational, or urban land, or land used for transportation—will probably not occur unless prices of land products rise sufficiently to justify the additional expense, or unless the intensified methods result in lower costs of production so that greater profits can be secured at current prices.

Removal of Obstacles to Most Efficient Utilization of Land Resources. Inadequate transportation is an important hindrance to most efficient or complete utilization of land resources in many areas. There is an economic limit to which a farmer, a lumberman, or a miner can transport his commodity, depending upon the scale of productive operations, state of the roads, means of transport, cost of labor, and market value of the product.[20] Railroad construction has been of tremendous importance to American agriculture. Railroads opened the interior to commercial farming, but lack of satisfactory side roads running into the back country on both sides of the right-of-way and dependence upon horses as the source of transport power prevented extension of commercial crop farming beyond these relatively narrow strips. Ranching was developed more extensively back from the main railroad lines, since cattle and sheep could be driven relatively long distances to market.[21] Webb tells of the efforts of Texans at the close of the Civil War to connect the four-dollar Texas cow with the forty-dollar northern market. Their immediate objectives in driving cattle northward were railheads from which the cattle could be shipped east. By 1866, several railroads—among these the Missouri Pacific, which had reached Sedalia, Missouri—had nosed their way across the Mississippi, following population to the edge of the Great Plains.[22] Cattle trails gradually reached from the Texas ranges to Wyoming, Montana, the Dakotas, and even Canada; and in the space of fifteen years the range cattle industry had spread over the entire Great Plains area.[23] Recent great expansion of highway construction accompanying the development of the modern automobile and truck has extended the areas of crop production and widened the areas of buying and selling agricultural produce. Increased use of air transportation, given impetus during World War II, will exert a similar influence. Future technological advances will tend to make for more adequate transportation and thus contribute to increasing the economic supply of land, particularly agricultural land.[24]

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[19] "Plugging up the Mediterranean Projected in Giant German Plan," *Christian Science Monitor,* September 30, 1933.

[20] Bowman, *The Pioneer Fringe,* p. 64.

The recent rapid growth of rural electrification in the United States has been another important factor reducing obstacles in the way of most efficient land utilization, especially agricultural land utilization. Modern electrical appliances and equipment make possible greatly increased output of product per worker.[25]

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[21] From 1933 to 1940 the U. S. government spent more on secondary roads than on the Federal Aid System—$1,165,000,000 on secondary and local roads compared with $965,000,000 on the Federal Aid System (through highways in cooperation with the state governments). Postwar plans call for an extensive road building program financed by the federal and state governments and including secondary and local roads as well as through highways. This tendency to construct feeder roads and national highways, and to centralize highway administration, was speeded up by the depression and the collapse of the general property tax as a source of revenue for local governments. As an emergency measure, and in connection with unemployment relief expenditures, the period of the thirties saw the initial participation of the federal government in local road construction. (*Technology on the Farm*, p. 114.)

[22] The distance from the range areas in Texas to Sedalia, Missouri, averaged between 500 and 850 miles.

[23] W. P. Webb, *The Great Plains*, Ginn, 1931, chap. VI.

[24] However, these technological advances have been responsible for the decline of many small towns and villages. For an analysis of the plight of the small town accompanying the developments in modern highway transportation, see W. G. Mather, Jr., "Littletown," *Harper's Magazine*, January 1935; and Dwight Sanderson and R. A. Polson, *Rural Community Organization*, Wiley, 1939, pp. 115–130.

One of the most important recent developments in removal of obstacles to efficient utilization of land is quick-freeze processing of vegetables, which makes green vegetables and small fruits available to city consumers out of season. By preserving these vegetables the market is expanded through increased consumption, provided costs can be kept relatively low.

Continual improvement in farm machinery, in methods of controlling animal and plant diseases, and in disseminating up-to-date agricultural information through agencies established by the federal government and the state agricultural colleges in the United States are good examples of ways to overcome obstacles to most efficient utilization of agricultural land through improvement of agricultural technique. Loss of foreign markets for agricultural products during the twenties and thirties has been another factor contributing to the need for additional agricultural information and improved practices to reduce American agricultural costs of production. Federal and state programs developed, especially during the thirties, to improve production methods and conserve agricultural lands have been important in meeting this need, with the result that farmers generally are a much more enlightened and progressive group than in earlier years. All of this has contributed to make utilization of agricultural land more efficient in the United States.

In strict economic terms, "production," or the creation of utility, necessarily includes all the steps in transferring the products from land to final consumers. Consequently, the effect of any circumstances or conditions which delay, waste, reduce the quality of, or destroy the product in its path to the final consumer is the same as a reduction in amount of land used for producing the good. Lack of market information on the part of producers, lack of quality standards, inefficient purchasing methods of consumers, and similar causes of inefficient distribution of food or other products of the land, such as lumber and mineral products, are all factors effecting a decrease in the economic supply of land.

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[25] The automatic water-pressure system follows closely the development of rural electrification, and cows produce more milk when water is readily available. Garden and limited-area irrigation seem to offer possibilities of greater income through production of more and better food for family use or for sale. (Use of electricity for brooding and for lighting laying hens has increased poultry production, and use of electricity for milking machines has increased the number of cows that the individual farmer can handle.) The bottleneck in milk production is often milking, and it has been found that in a herd of 20 to 25 cows a milking machine can save about half of the labor required at milking time, or in other words, that an individual can milk twice as many cows in the same time as before. The extent of the rapid growth of rural electrification in the United States can be seen from the fact that scarcely more than 100,000 rural homes received current from electric power lines in 1919, whereas by June 1940 the number had increased to approximately 2 million, or approximately a third of the farms. It is estimated that perhaps 50 per cent of American farmers will have electric service by 1950. (See *Technology on the Farm,* chap. XVII, pp. 108–112.)

Adjusting Human Consumption to Consume Products That Can Be Produced Most Easily. The economic supply of land can be increased by adjusting human consumption to what the earth can produce most efficiently. For example, in the case of agricultural land, the same acres should be made to feed many more people if certain changes in human diet were made. It has been estimated that if the United States reduced its per capita consumption of meat one-third, and compensated for this decrease by a proportionate increase in the use of dairy products and vegetables, the nation could almost double its population without diminishing its real welfare.[26]

Shifts from less productive to more productive crops per acre—especially from grain and hay to fruit and vegetables—resulted in increasing United States crop production by the equivalent of about 14 million acres of crop land between 1919 and 1929. Shifts from less productive to more productive animals per unit of feed consumed—particularly from beef cattle to dairy cattle, hogs, and poultry—resulted in increasing production by the equivalent of about 9 million acres of crop land. Consequently, these two shifts accompanying changes in dietary habits increased agricultural production by the equivalent of some 23 million acres during the twenties.

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[26] The consumption of meat per capita in the United States is much higher than that in some other leading nations. For example, after the First World War, U. S. per capita consumption of meat (including lard and poultry) was about 170 pounds compared with about 100 pounds in Germany and only 4 pounds in Japan. Baker indicates that if the annual per capita consumption of meat in the United States were cut to 50 pounds and compensated by a proportionate increase in the consumption of dairy products and vegetables, our diet would be fully as nutritious as before, and would enable the nation to double its population. This is made possible by the fact that a total of less than four acres (2.35 acres of crop land and 1.6 acres of pasture land) are required to produce 1,400,000 calories of dairy products, while to produce the same amount with beef requires almost 14 acres (11.3 of crop and 2.5 of pasture). (See O. E Baker, "Land Utilization in the United States," pp. 14–15; and L. C. Gray and O. E. Baker, "Land Utilization and the Farm Problem," U. S. Department of Agriculture, Miscellaneous Publication 97, 1930, p. 33.)

Human diet can be influenced to a large extent by proper education and adequate information. Nutritional research information, coupled with taxation and government control of the availability of certain food products, particularly during war periods or similar emergencies, can do much to control consumption and direct it into channels resulting in increased consumption of products most easily produced. The net result of such efforts is to increase the efficiency of the land, which has the same effect as increasing the economic supply. Conversely, shifts in diet in the opposite direction have the effect of reducing the economic supply of land. Similar conclusions can be applied to urban, forest, mineral, or recreational land, and land used for transportation purposes. If people demand more of those products or services which can be furnished most readily or with the least cost, the economic effect is to increase the supply of land; whereas if they desire from the land more of those goods or services which are most difficult to produce or for which only a limited land supply is available, the net result will be a decrease in the economic supply of land.

Reduction of Population. While changes in dietary habits affect the economic supply of land, the effect of these changes should be distinguished from the effect of changes in population numbers. A declining population, or one in which the rate of increase is declining, will reduce demand for land and consequently have the same effect as an expansion in the economic supply of land. On the contrary, a population expanding rapidly because of a rising birth rate and declining death rate will have the effect of enlarging demand for land and making the current supply of available land resources increasingly inadequate. Education, governmental policies, custom, and similar factors are important influences upon population trends, particularly on the birth rate. Development of medical science has been important in lowering the death rate. The effects upon the economic supply of land of current population trends in various nations will be discussed in more detail in the next chapter.

Control of Foreign Trade. Another method of increasing the economic supply of land is to reduce agricultural and industrial exports, or to increase the importation of such products. During the First World War period, agricultural and industrial exports expanded greatly, amounting to some 5 billion dollars in 1918. The slogan, "Food Will Win the War," resulted in bringing a large additional acreage of agricultural land into use in the United States to supply armies in Europe. The decline in foreign trade after the war and during the thirties reduced the total demand for and depressed prices of agricultural and industrial products.

The foreign trade policy which a nation adopts will influence the land utilization pattern within the nation. For example, the British Isles for many decades has encouraged importation of agricultural produce and raw materials by a free trade policy. In the case of exporting nations such as Canada or Argentina, loss of foreign markets or heavy importation of agricultural and industrial products has the same effect as increasing the economic supply of land available to their citizens. The high tariff barriers erected by many nations after the First World War brought about significant shifts in land utilization and in the economic supplies available for various uses in different areas of the world. For the world as a whole trade policies of individual nations have little effect upon economic supply of land, because increased imports in one nation are offset by increased exports in another nation, and vice versa. However, since there is a lag in the time at which land-use adjustments are effected in other nations in response to measures adopted in a given nation, the trade policies of any nation influence the world economic supply of land for various uses.

Physical Conditions and Economic Response of Land. The enumerated methods of increasing or decreasing the economic supply of land all involve human action, or man-made inventions or innovations. Man can control these factors so as to alter significantly the amount, quality, and kind of land needed to satisfy his wants. Some of these methods are much more effective than others in determining the elasticity of land supply.

But man does not control all of the factors determining elasticity of the supply of land for various uses, although he plays a significant part. Physical factors condition the economic supply of land for various uses, and are in most cases subject to man's control or modification only in a limited way. These physical conditions differ according to the major use to be made of land. The physical factors limiting the economic supply of land for forests are significantly different from those limiting the economic supply of land for agriculture; and those forces limiting the supply for mining, for urban utilization, or for recreation or transportation are all peculiar to the types of use which may be made of the land resource. These are discussed in some detail in Part III.

CLASSIFICATION OF LAND RESOURCES

The purpose of land classification is to arrange land resources systematically in various classes or groups on the basis of certain similar characteristics, so that man may identify and understand their fundamental characteristics and utilize them most intelligently and effectively in satisfying his wants. Thus, classification is important not only in indicating the physical supply of land available for various uses, but also in influencing the economic supply through more intelligent and effective utilization.

Classifications have been developed on many different bases to serve specific purposes. Land bodies may be classified on their relative suitability for some particular use such as grain production or grazing; or they may be classified to indicate the enterprises, or sizes and types of operating units, which would be most effective in utilizing them. Again, classification may deal with soil types or other physical characteristics of land, or ownership, or some other basis. In any case, the form of classification to be used will be determined by the objectives which classification is to serve.

Since land is used in a great many ways and varies widely in its physical characteristics, it is particularly essential that proper consideration be given to its adequate classification. It is sometimes impossible to detect by casual observation those basic characteristics which largely determine the productive ability of the land. Many mistakes have been made in the past because there has not been readily available an adequate classification.

Objectives of Land Classification. In order to secure the maximum products and services and at the same time conserve resources for the use of future generations, man must adapt his utilization practices to the basic natural capabilities of the land. However, a more specific objective will ordinarily be needed to justify a classification of land, because classification involves considerable time and expense. A clear, specific statement of objectives for which classification is to be made helps to show the type of classification procedure which should be followed.

Classification of land is not an end in itself, but a means of obtaining better land use. Specifically, the objectives of classifying land may be grouped into eight major categories.[27] (1) More enlightened and economically sound land settlement policies both public and private; (2) guidance in public land purchase and development; (3) planning the organization and distribution of local governmental services; (4) guidance in the distribution of public aid, particularly federal and state subventions and public relief to local areas; (5) guidance in determining sound real estate lending and borrowing policies; (6) equalization of land assessments for taxation purposes; (7) guidance in developing and administering programs for improved land utilization practices, soil conservation and erosion control measures, and similar practices; and (8) guidance in developing sound farm management policies and organizing the most effective type and size of operating units.

Classification and Wise Land Settlement. Failure to classify land properly before settlement and development has resulted in the disappointment of many private ventures in land utilization. Most of the lands in the United States, Canada, and other nations have been settled without any systematic body of information setting forth the use capabilities or characteristics of the land at the time of settlement. If lands could be classified properly and zones established, based upon the boundaries of lands with common characteristics and adaptabilities for certain uses, and if individuals and agents selling land were required to place in the hands of prospective purchasers an official report setting forth these characteristics and capabilities, much ill-advised and injudicious settlement and utilization of land could be avoided.

Land classification is also essential in establishing districts or zones in which certain detrimental land uses are to be legally discouraged. Before the area can be zoned, the land must be classified according to the uses which may or may not be allowed. Zoning is one of the more important means of controlling land use and the supply available for various uses. Even though there may be established no legal zones prohibiting certain uses determined to be undesirable, based upon sound classification of the lands, classification can be very useful in guiding private land settlement by making available to settlers and to individual farm and ranch operators reliable information regarding the use capabilities of the land.[28]

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[27] Barnes lists some fourteen specific objectives of land classification, many of which are closely related. The accomplishment of one often results indirectly or incidentally in the attainment of others. These fourteen objectives can be grouped into the eight major categories indicated. (See C. P. Barnes, "Land Classification: Objectives and Requirements," U. S. Resettlement Administration Land Utilization Division, Land-Use Planning Publication 1, February 1936, mimeographed, pp. 3–12.)

Classification as an Aid in Public Land Purchase and Development. Public acquisition of rural lands, in addition to public areas such as national parks, highways, national monuments, state parks, primitive areas, watersheds, wildlife refuges, and similar areas has been largely limited to forest lands. However, the federal government embarked in the early thirties upon a policy of purchasing certain "submarginal" areas, particularly in the Great Plains region, as a means of checking undesirable land-use practices.[29] Sound land classification helps determine whether public acquisition should be used to achieve the desired ends—namely, to prevent continuation of land-use practices harmful to the general welfare, or to prevent further loss of individual well-being and capital.

In many areas where land has reverted to public ownership because owners have found it cheaper to lease than to own, or where individuals have been unable to meet their tax payments and have abandoned their lands, land classification helps to determine which of these lands should be returned to private ownership in the interests of the public good, and which should be retained in public ownership for certain definite public uses.

Classification as an Aid in Planning the Organization and Distribution of Local Governmental Services. The cost of local governmental services and necessary facilities, including roads, schools, electric power and telephone lines, and health services, is an important item in rural and urban operating and living costs in many areas. Land classification based upon detailed problem analyses, including cost of production and income studies, helps to determine the productive capacities of the lands, and consequently the capacity of the local areas to meet the costs of these various services. Where the land classification indicates that the established pattern of local governmental services is probably too expensive for the land resources of the community to support, classification is useful in furnishing the basic data for planning the size and organization of alternative local governmental units, in order to bring cost of local public services within the means of the community.

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[28] In California, the law requires prospective purchasers of the land in a subdivision to be supplied with a report of the character of the land and its suitability for the specific uses to which it is advertised as being adapted. (See Barnes, *op. cit.*, p. 5.) The entire subject of land settlement is discussed in more detail in the next chapter.

[29] For a statement of the problems associated with public acquisition of submarginal lands, or the retention of lands that are reverting to public ownership through tax delinquency, see "The Problems of Submarginal Areas and Undesirable Adjustments, with Particular Reference to Public Acquisition of Land," National Land Use Planning Committee and National Advisory Legislative Committee on Land Use, Publication 6, April 1933.

Problems resulting from the disparity between local public service patterns and productivity of the lands are likely to be more acute in sparsely settled areas. There are, of course, sparsely settled areas in which occupancy is justified, but a proper land classification is necessary to determine which areas should be occupied and furnished necessary public services. Such a classification would be of considerable assistance to state and federal agencies endeavoring to determine the amount and distribution of public relief and grants-in-aid.

Classification as an Aid in Distributing Public Funds to Local Areas. If current conditions in the community are temporary or of an emergency nature, state and federal grants-in-aid would be justified to assist in supporting local governmental services like schools, roads, and health facilities; but if human occupancy and local governmental services or the present organization and administration of these local services are on a basis disproportionate to productivity of the local land resources, such state and federal grants-in-aid would not be justified without acompanying adjustments.

Classification and Extension of Land Credit. Land classification is particularly useful to borrowers and lenders in guiding extension of credit. Successful loan experience depends to a large extent upon the relationship of the amount loaned to the productivity of the land. By providing physical and economic information concerning production capabilities of the soil, land classification makes possible more intelligent lending and borrowing practices. Such classification is also basic in providing necessary information for satisfactory investment of capital in lands, both rural and urban. Many distress transfers of farm and city properties in past years could have been avoided had suitable land classification data been available and followed at the time the loans were made.

Classification and Tax Assessment. One of the most important uses of land classification data is as a basis for tax assessments. Assessment of lands according to economic productivity is an important factor in reducing tax delinquency and tax deed foreclosures to a minimum. Land classification data which reveal the use capabilities of the lands are important in computing assessments in accordance with productivity.

Studies of present agricultural land assessments indicate that there is a widespread tendency for poorer lands to be most overassessed in relation to their comparative ability to produce. A soil survey by a soil scientist is desirable to determine productivity ratings of different grades of soil, and use of such data is helpful in making assessments proportionate to the relative productivities of different grades of land.

Classification as a Guide in Developing and Administering Programs for Improved Land Utilization Practices. Land classification if properly done may furnish basic data showing types and boundaries of soils particularly subject to erosion and soil wastage, and types of farm management practices which best conserve land resources. Such agencies as the Soil Conservation Service have found land classification data particularly useful in showing extent and type of erosion, and have found cropping practices or erosion control measures suited to different soil types, for reducing erosion and conserving soil fertility. In some areas, measures can be effected to reduce soil waste—proper soil management, crop rotations, strip cropping, terracing, or contour furrowing, for instance—without any change in size or type of farm operating unit; and in such areas classification of land will be designed primarily to show cropping or grazing systems or soil management practices suited to the given body of land.

Classification as an Aid in Determining Type and Size of Operating Units. In many areas adjustments are needed in type or size of farm operating unit to secure most effective land conservation and adequate family living. In some regions, most operating units are too small to furnish adequate family living without using the lands in ways which result in erosion and fertility wastage. Ascertaining types of adjustments necessary to improve family living and to conserve land resources requires land classification that will show the fitness of various lands for different combinations of enterprises and the acreage required for efficiency in operation, maintenance of fertility, reduction of erosion to a minimum, and adequate family living.

Requirements of a Suitable Classification. If classification of land resources is to be useful, land classes must be simple and distinct, easily understood and easily recognized, measurable, and economically significant. For example, a classification which indicates merely that two pieces of land are composed of soils formed from entirely different materials would not have much practical value for the average farmer, who is concerned with the methods by which these two pieces of land can be most effectively used, and with their relative economic importance or value for specific agricultural uses.

In the past, farm operators have criticized land classifications, particularly of agricultural land, on the grounds that they were too technical and vague, or not stated in practical terms—such as yields per acre in the case of crop lands, or carrying capacities in the case of range lands, or productivity values in dollars and cents. These types of data are very useful in helping farmers and ranchers to understand how they can most effectively use their lands, how much they can afford to pay or borrow, what the assessed valuations of their lands for real estate tax levies should be, and similar questions important in determining profitableness of farm operations. Similarly, the classification of transportation, mineral, recreational, urban, and forest lands must be such that the categories are sufficiently distinct and tangible to form the basis for economic appraisals of their relative importance. No one classification can serve all purposes. As yet, no system developed or in use meets all these requirements, although a few, such as the North Dakota Taxation Classification, have served well in certain special problem situations.

Types of Land Classification. The use to be made of land classification determines the basis of the classification. There are two major types of land classification—physical and use classification. Physical classification groups soils according to their natural qualities, while use classifications include, in addition to these physical factors, all economic forces which condition the use man makes of the land. When land is classified on the basis of physical or inherent characteristics alone, certain natural qualities are looked for such as topography, soil characteristics, vegetative cover, rainfall, chemical composition, climate, position, and similar physical factors. Physical characteristics of the land determine the limits of land utilization.

Physical characteristics play a particularly important part in forest land use as well as in agricultural land utilization. They have a less limiting role in the case of urban land utilization. Topography is an important factor determining the use of land for transportation purposes; and in the case of mining, physical characteristics are important principally in determining quality and availability of ore deposits. In the case of recreational land use, climate is an important factor and topography, water area, native vegetation, and native animal life are also significant; but the character of the soil is usually a minor consideration.

Natural land types may be differentiated by characteristics of climate and surface configuration, and by location, size, and shape of individual bodies, as well as by soil characteristics. A *soil type* includes land which has a specific set of soil characteristics, while a *land type* is broader and consists not only of soil but of relief, vegetation, and related factors. In other words, a soil type is only one example of a natural land type.[30] Classification in which the soils are grouped into various types is particularly important in agricultural land utilization, because growth and production of plants depends largely upon the nature of the soil. Soils that are deep, pervious, of proper chemical composition, located within a favorable climate, and retentive of moisture can successfully grow a wide range of plants.

Soil is the combined product of climate, living organisms, physical relief, parent material, and age, different combinations of these factors producing different soils.[31] The growth of plants on the soil is closely related to the characteristics of the *soil profile* (a vertical section of soil, commonly from four to eight feet deep). The soil profile is composed of various layers known as *soil horizons,* which vary in texture, structure, thickness, position, and chemical composition. Because of the close relationship between the growth of plants and the characteristics of the profile, it is possible to rate soils for agricultural productivity with the profile characteristics as a base. It should be kept in mind that soil is only one of many factors that determine value for any given area of land surfaces, even in the case of agricultural or forest land; but it is a very important one, and its natural physical or inherent qualities constitute one of the more stable elements determining land productivity and, consequently, land value and use.

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[30] Barnes, *op. cit.*, p. 13.

[31] *Soils and Men,* U. S. Department of Agriculture. *Yearbook,* 1938, p. 988; and R. Earl Storie, "An Index for Rating the Agricultural Productivity of Land,"University of California, Agricultural Experiment Station Bulletin 556, 1933, p. 3.

The second major type of classification, "use classification," definitely introduces land utilization—the ways in which man employs land for satisfaction of his wants. Three principal types of land classification, in terms of use, may be listed: (1) present use, (2) use capabilities, and (3) recommended use.[32] Thus, in addition to natural qualities of the land, economic considerations such as market accessibility; size and type of operating unit; size, distribution, and composition of the population; location of roads, schools, power lines, stores, factories, and mines; location, size and type of properties; type of ownership; economic outlook and price prospects; transport facilities; costs of production; and related economic items must be taken into consideration in determining uses to which the land can be most efficiently put. In the use classification of land, grades must be sufficiently clear and meaningful to make it possible to determine readily those which are submarginal for certain types of utilization and those distinctly above the margin.

Physical Classification of Land. An example of the technique used to classify lands on the basis of natural or inherent characteristics is the composite index method developed by Storie[33] for classifying agricultural lands. In this method, three factors are used—(*A*) Character of the soil profile, (*B*) soil texture, and (*C*) other modifying factors such as drainage, ease of irrigation, alkali conditions, and other miscellaneous conditions. Each of these three factors is evaluated on the basis of 100 per cent for the most favorable or ideal conditions. The composite rating is determined by multiplying together factors *A*, *B*, and *C*. The source of basic data from which such a composite index is computed is a soil survey, of one of three principal types—*detailed*, *reconnaissance* (see Figure 2), or *detailed-reconnaissance*.[34]

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[32] The National Resources Planning Board has grouped land classification projects into five categories, each representing a distinct type of land classification. These five types are (1) land classification in terms of inherent characteristics, (2) land classification in terms of present use; (3) land classification in terms of use capabilities, (4) land classification in terms of recommended use, and (5) land classification in terms of program effectuation. (See National Resources Planning Board, "Land Classification in the United States," Report of the Land Committee, 1941, p. 3.)

[33] *Loc. cit.*

[34] In the *detailed* soil survey, the land is traversed at intervals of one-fourth mile, and in addition to such physical features as lakes and streams, relief and

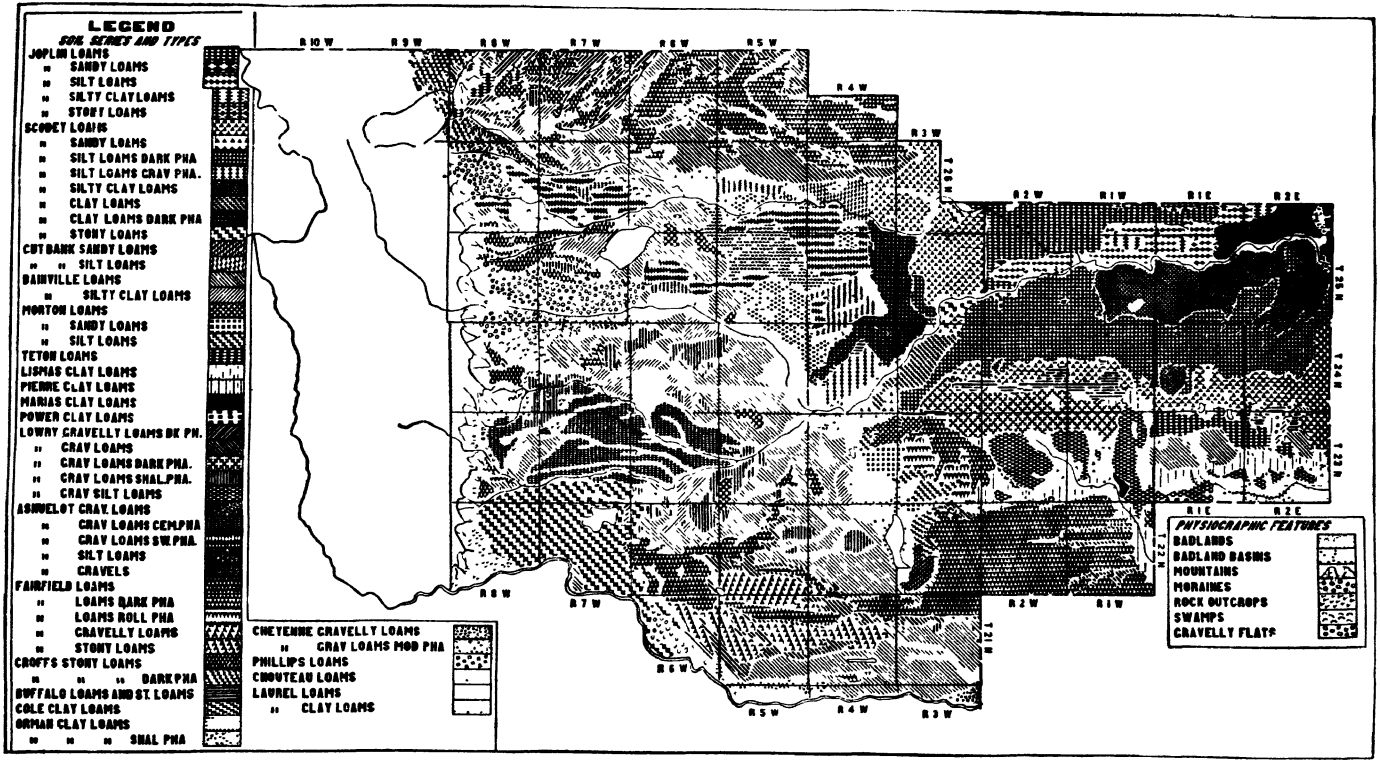

FIGURE 2. Soil Reconnaissance Map of Teton County, Montana, Showing Soil Series and Types, and Physiographic Features.

Factor *A* evaluates all characteristics of the soil profile except the texture of the surface soils. These characteristics are used to separate soils into groups known as *soil series*.[35] The soil series is in turn divided into soil types on the basis of *texture* (factor *B*).[36]

Within given soil types there may be differences in relief, erosion, and stoniness significant in the use of the soil when the land is cultivated. Such differences are recognized and mapped as *phases* of specific soil types.[37]

Factor *C* includes other factors influencing soil productivity such as drainage, alkalinity, acidity, infertility, susceptibility to erosion, or weediness.[38]

The ratings for factors *A*, *B*, and *C* are determined on the basis of 100 per cent for the very best characteristics of each of these factors, and the final soil rating or index is then obtained by multiplying *A* × *B* × *C*.[39]

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stoniness, the significant culture features such as ditches, roads, houses, and public buildings are accurately plotted. In the case of a *reconnaissance* soil survey, mapping units are defined with less precision, from traverses made at intervals varying from a half-mile to six miles. The less intensive the use to which the land is likely to be devoted, the more likely are traverses to be made at less frequent intervals. A *detailed-reconnaissance* survey has portions surveyed according to the requirements of a detailed soil survey, and portions according to the less rigid requirements of a reconnaissance survey. The county is the usual unit of survey, and frequently contains large areas of land obviously unsuited to intensive agricultural use which are mapped in reconnaissance and published with the portion mapped in detail, on the same soil map. (Adapted from Charles E. Kellogg, "Soil Survey Manual," U. S. Department of Agriculture, Miscellaneous Publication 274, 1937, pp. 12–13.)

[35] A soil series may be defined as "a group of soils having in general, the same character of profile—that is, the same range in color, structure, and general sequence of soil and subsoil horizons, the same types of relief and drainage, and a common or similar origin or mode of formation." C. F. Shaw, "A Glossary of Soil Terms," American Soil Survey Association Bulletin 9, 1927, pp. 28–58.)

[36] The term "texture" refers to the size of the soil particles, and the term "structure" to their arrangement. (Stone, *op. cit.*, p. 24.)

[37] An example of terms used in designating characteristics of soils is the phrase, "Morton silty clay loam, eroded phase." In this phrase, designating a given Montana soil, "Morton" is the series name, "silty clay loam" the type name, and "eroded" the phase (in this case, accelerated loss of surface soil).

[38] For an explanation of the meaning and measurement of some of these factors see Kellogg, *op. cit.;* and U. S. Department of Agriculture, *Soils and Men*, p. 986.

[39] The main reason for multiplying the ratings for the three factors together to determine a composite rating for the soil, rather than adding the score for each of the three factors together as in the case of the score-card method, is that each of the factors considered has a limiting influence upon the total productiveness or value of the soil.

The U. S. Department of Agriculture through its Soil Survey Division, has suggested a method of rating soil productivity which includes ratings for individual crops as well as a general rating for the soil itself.[40] Hammer emphasizes the individual soil elements that determine productivity, and suggests a group of factors he refers to as "unit soil factors" as criteria in land classification—texture, nitrogen content, lime and potassium requirements, readily soluble phosphate, clay pans, depth of surface soil, and topography.[41] These factors are the basic soil constituents which determine physical productivity in many areas, although in the semi-arid regions water availability is in many cases the limiting factor for physical productivity.

Use Classification of Land. This type of classification, as indicated earlier, takes into consideration characteristics of land other than the strictly physical or inherent ones. Thus, land classification, in terms of *present use,* concerns (1) kind of use, (2) characteristics of use, and (3) status of occupancy.[42] In ***use-capability*** classifications, two types of knowledge are essential—knowledge of the natural qualities of the land, and knowledge of the results of using lands having these natural qualities.[43] In Montana the principal dry-

[40] This double rating system necessitates preparing specific crop productivity indexes for various crops which might be grown on the land. This system has been used in several states. For more detail see W. G. Murray, *Farm Appraisal,* Iowa State College Press, 1940, p. 58.

[41] C. H. Hammer, "Factors Affecting Farm Land Values in Missouri (From an Appraisal Standpoint)," Missouri Research Bulletin 229, 1935.

[42] In "kind of use" classification, the land is classified area by area, field by field, to show how it is used. In "characteristics of use" classification, where the objective is agricultural land use, types and yields of crops are mapped; and in the case of mineral lands, types and current production of mines are mapped. "Status of occupancy" classification includes collection of data related to ownership, mortgage indebtedness, tax delinquency and tax-deed foreclosure status, assessed valuation, and related information. It is significant that 53 of the 75 land classification projects studied by the National Resources Planning Board included present use classification. (See National Resources Planning Board, "Land Classification in the United States," p 4.)

[43] The National Resources Planning Board found 53 out of 75 current projects included use-capability classifications relating to agriculture, forestry, recreation, mining, wildlife, and water resources. (See National Resources Planning Board, "Land Classification in the United States," p. 6.) Gooze shows the use capability classifications which have been developed in several states in recent years in an attempt to meet the land use problems with which these states are confronted. (See Charles Gooze, "Progress in Rural Land Classification in the United States," Land Policy Circular Supplement, Resettlement Administration, Washington, D. C., December 1935, mimeographed.)

land crop is wheat, so that the use classification of such lands is in terms of productivities of this principal crop and use classification of grazing lands is in terms of carrying capacity for livestock grazing (see Figure 3). Quantitatively, bodies of this type of cropland are classified as follows: first grade, 22 bushels or more; second grade, 16 to 21 bushels; third grade, 12 to 15 bushels; and fourth grade, 8 to 11 bushels.[44]

Recommended use classification involves a consideration of the physical characteristics of each parcel of land, together with its present use and its use capability in terms of each use to which it might be put. Thus, classification in terms of recommended use is based on the results of each of the preceding three types of land classification, or in any case involves the use of all three of them.[45] Classification in terms of recommended use is based on the constant effort to develop new methods and practices of land utilization which will promote higher economic and social returns. In this connection, the final purpose of all land classification is some form of action which will put the recommended land uses into effect.

Development of Land Classification in the United States. The policy of the United States Government during the years just after the Revolutionary War was to get large areas of the public domain into private hands with the least possible delay. Although as early as 1796 a law was passed providing that "Every surveyor shall note in his field book the true situations of all mines, salt licks, salt springs, and mill seats which shall come to his knowledge; all water-courses over which the line he runs may pass, and also the quality of the lands,"[46] the classifications reported by surveyors were very

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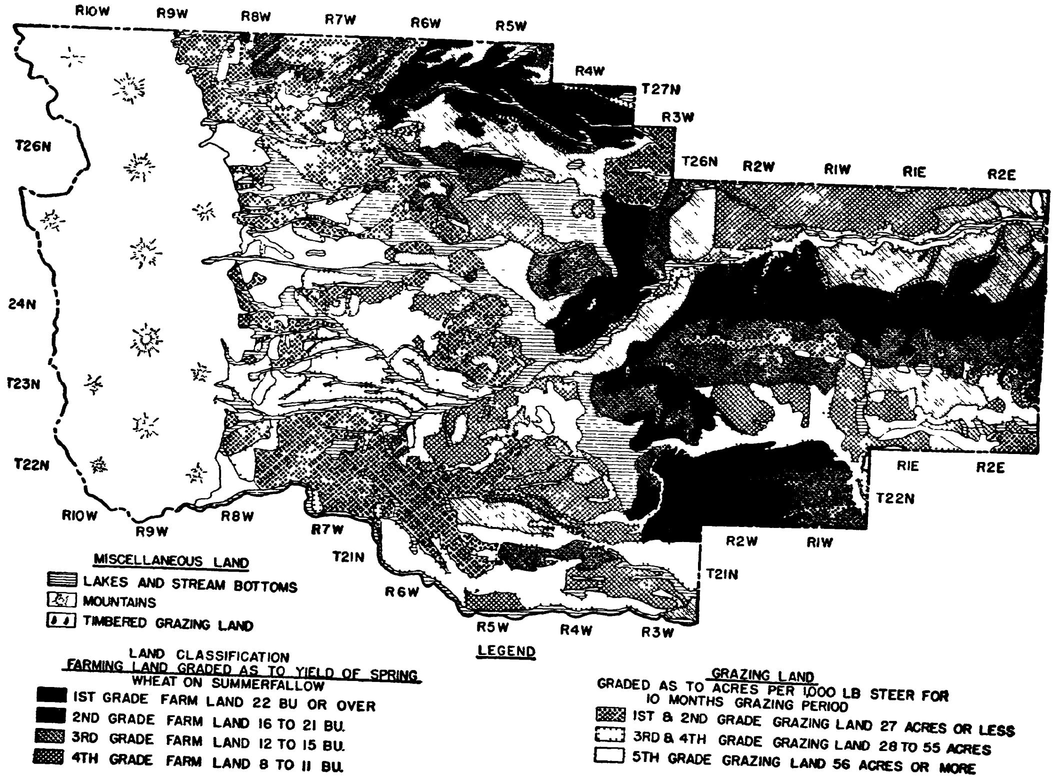
[44] For an explanation of the method of arriving at these grades for dry farm land, as well as that used for arriving at similar grades for grazing land, see L. F. Gieseker, "The Soil Profile and Its Interpretation," Montana Agricultural Experiment Station, 1938, mimeographed; and R. R. Renne, and H. H. Lord, "Assessment of Montana Farm Lands," Montana Agricultural Experiment Station Bulletin 348, October 1937.

[45] See National Resources Planning Board, *op. cit.* It is significant that of the 75 land classification projects studied, less than half as many are described as classifying land in terms of recommended use as in terms of present use. However, land classification projects of the first three types all have as their major goal the making of recommendations for best land use, or the furnishing of basic information upon which such best land use might be determined.

[46] U. S. Department of the Interior, *Manual of Instructions for the Survey of the Public Lands of the United States*, Government Printing Office, 1930, p. 12.


R10W
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T27N
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T26N
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R2E
T26N
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R8W
R7W
T21N
R6W
R5W
R4W
R3W
T21N
R2W
R1W
T22N
R1E
R2E
LEGEND
MISCELLANEOUS LAND
▤ LAKES AND STREAM BOTTOMS
MOUNTAINS
TIMBERED GRAZING LAND
LAND CLASSIFICATION
FARMING LAND GRADED AS TO YIELD OF SPRING WHEAT ON SUMMERFALLOW
■ 1ST GRADE FARM LAND 22 BU OR OVER
■ 2ND GRADE FARM LAND 16 TO 21 BU.
▩ 3RD GRADE FARM LAND 12 TO 15 BU.
▩ 4TH GRADE FARM LAND 8 TO 11 BU.
GRAZING LAND
GRADED AS TO ACRES PER 1,000 LB STEER FOR 10 MONTHS GRAZING PERIOD
▩ 1ST & 2ND GRADE GRAZING LAND 27 ACRES OR LESS
▨ 3RD & 4TH GRADE GRAZING LAND 28 TO 55 ACRES
□ 5TH GRADE GRAZING LAND 56 ACRES OR MORE

FIGURE 3. Land Use-Capability Classification Map of Teton County, Montana.

meager. Nearly 100 years later, in 1879, an act was passed providing for classification of public domain land by geological survey directed from the Department of the Interior. However, this classification apparently applied largely to mineral lands and left out of consideration the agricultural quality of the land.[47] In 1899, the Soil Survey Division of the U. S. Department of Agriculture was established for the purpose of defining and mapping important soil types in the country.[48] Investigations begun by the Soil Survey Division have continued, in cooperation with the agricultural experiment stations of the states and territories, up to the present, and some two million square miles have been covered by reconnaissance or detailed soil surveys. The greater part of the surveyed area has been mapped on a scale of approximately one inch to a mile, each map in a majority of cases representing one county.[49] The "rectangular system" of land surveying is shown in Figure 4.

As the science of soil survey has progressed, the classifications have become more scientific and are based more and more upon the natural characteristics of the soil itself. During the late thirties, soil survey work was greatly speeded up in many areas because of the needs of various federal and state action agency programs dealing with agricultural adjustment, particularly the Soil Conservation Service and the agricultural land use planning activities of the U. S. Department of Agriculture.

Many of the states have undertaken land classification work to meet current land use problems. The increase in farm tax delinquency and mortgage foreclosures in the thirties, and the dust storms and related conditions which developed in some areas, increased the need for land classification data. In many states, land-use capability classifications have been developed and are being widely used in determining land use adjustment programs best fitted to secure most suitable use of land resources. Considerable variation

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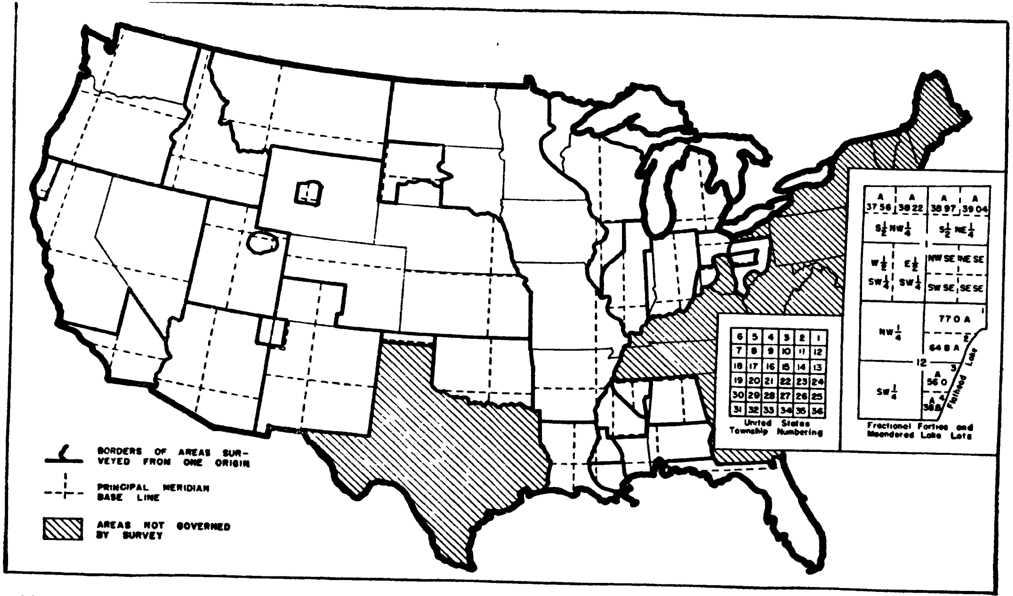
[47] Hibbard divides the history of the classification of the public lands into four periods—from 1785 to 1862, from 1862 to 1879, from 1879 to 1906, and from 1906 to the present. For a concise statement of the types of classifications inaugurated for the public domain during each of these periods, see B. H. Hibbard, *History of the Public Land Policies*, Macmillan, 1924, p. 488; and for the development of land classification in the United States see also National Resources Planning Board, *op. cit.*, chap. III, pp. 10–22.

[48] U. S. Department of Agriculture, *Soils and Men*, p. 981.

[49] See Gooze, *op. cit.*, p. 3; C. E. Kellogg and J. K. Ableiter, *A Method of Rural Land Classification*, U. S. Department of Agriculture, Technical Bulletin 469, 1935.



6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

FIGURE 4. United States Land Survey, Principal Meridians, Base Lines and Township Numbering. The "rectangular system" of land survey was incorporated in early land laws (1784–1785) after the public domain was acquired. Township lines are run every six miles north and south from the base lines and east and west from the principal meridians. Each township comprises 36 sections of land which are numbered as indicated. Canada reverses the United States order of designating sections. Sections (one mile square, or 640 acres) are divided into quarter sections, which in turn are divided into 40-acre units. In older parts of the United States and Canada, land is usually described and registered by metes and bounds, natural objects such as trees and rocks designating points connecting surveyors' lines.

exists among the states in the techniques used in classifying lands. However, each state should develop land use capability classifications which fit the situations and land use problems of its particular area.

Weaknesses of Land Classification in the United States. One of the major weaknesses of land classification in the United States, as far as practical applications are concerned, is the technical nature of much of the material which has been mapped and presented covering natural soil characteristics. The terms used have been technical, and insufficient effort has been expended in translating soil classification data into more practical grades and use capability classifications which are simple, understandable, and of practical significance.

A second weakness is the tendency to include too much in the land classification process. Land classification has been used to include at one extreme the soil surveys and classification of vegetative cover, and at the other extreme detailed administrative decisions concerning recommended land use practices by areas. Such a broad concept has caused confusion and misunderstanding. Research and effective planning in resources utilization will be expedited by recognizing the inherent limitation of land classification to "the descriptive art of arranging and sorting land facts cartographically as a tool for the study and planning of resource utilization,"[50] not the planning process itself or the final product.

Another weakness is the fact that a large portion of the continent has not yet been classified[51] (see Figure 5). Land classification has been spread over such a long period of time in some states that considerable rechecking is already needed on lands first classified, be-

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[50] W. F. Musbach, and V. Webster Johnson, review of the National Resources Planning Board report, "Land Classification in the United States," in the *Journal of Land and Public Utility Economics*, vol. XVII, no. 4, November 1941, pp. 489–493.

[51] There are some 2,850,000 square miles in the continental United States which have reasonable possibilities for crop, grass, or tree production. Satisfactory detailed soil maps on a scale of one inch to the mile have been made covering 840,000 square miles, and reconnaissance maps on smaller scales are available for a considerably larger area. These have been prepared during the forty years since soil survey work was initiated. Some of the existing maps are not sufficiently precise for the detailed planning of farm operations, and it is estimated that detailed soil maps need to be made for about 1,250,000 square miles, and less detailed or reconnaissance surveys for about 880,000 square miles, which would cost between 35 and 50 million dollars. (U. S. Department of Agriculture, *Soils and Men*, p. 213.)

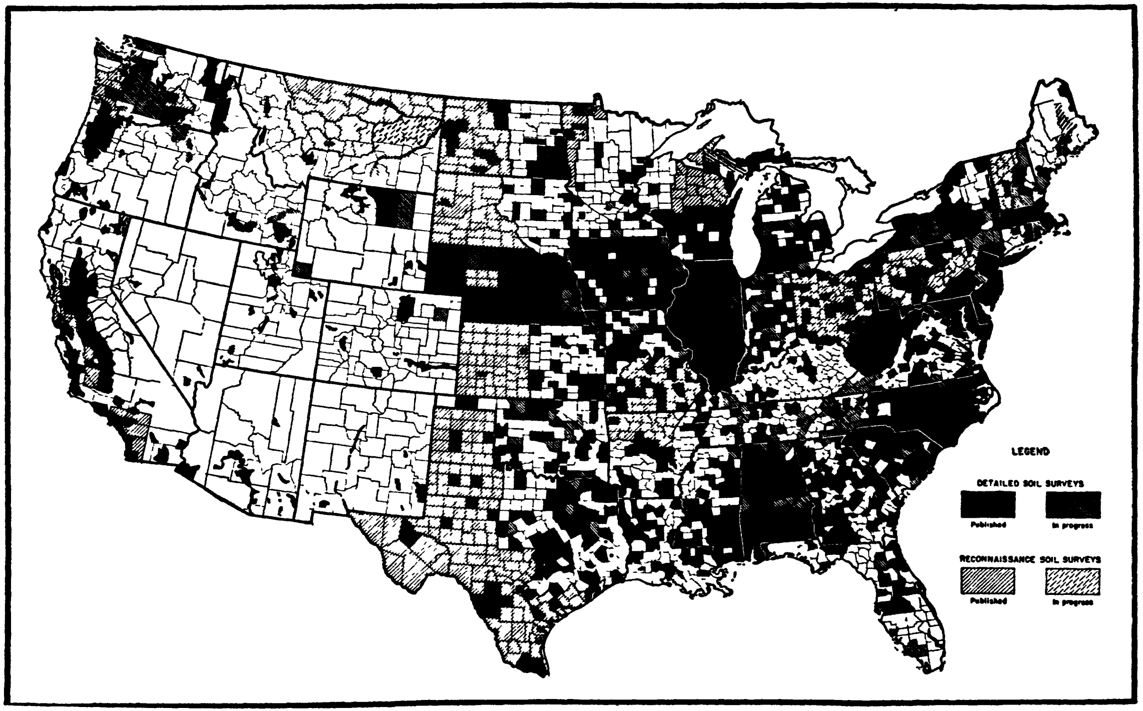

FIGURE 5. Areas of the United States Covered by Soil Survey, January 1945. (Source: U. S. Department of Agriculture; Agricultural Research Administration; Bureau of Plant Industry, Soils, and Agricultural Engineering.

fore all lands of the state have been classified for the first time. Moreover, the time required to make a proper soil survey, which takes into consideration the results of experience and carefully analyzes the physical characteristics and use-capabilities of the soils, handicaps certain land use adjustment efforts. The desire of some action agencies to push their activities forward rapidly has caused them to make their own soil classifications, with the result that lack of uniformity in the basic soil classification data may occur.

Another important weakness of land classification in the United States is that many lands have been classified for specific purposes in unscientific ways. For example, some states have passed laws requiring land to be classified for tax assessment purposes, but these classifications have not been made by men trained in soil science, with the result that the classifications do not serve the purposes for which the classification was undertaken, and are of little use in determining capabilities and best land use. For example, one western county lists a class of land known as "engine land," including all land which can be farmed with a tractor. In other words, this classification depends largely upon topography and is entirely inadequate for scientific assessment based on productivity. Such classifications tend to undermine the average farmer's confidence in the practical usefulness of land classification work.

These are but a few of the weaknesses characterizing land classification in the United States. Certain types of soil research are badly needed to furnish essential data for improved land classification. Chemical analyses showing composition and available nutrients are lacking for a great many of our important soil types. More precise information is needed regarding physical and chemical changes in arable soils resulting from use, and research establishing the relationship between nature of the soil and quality of food plants which may be grown on it is highly desirable.[52] With the emphasis upon improved land use and soil conservation accompanying recent drought, depression, and soil erosion, many of these weaknesses are being overcome and more scientific, improved methods are being developed. A definite need exists for greater co-ordination of effort among the many agencies interested in land use adjustment, particularly on agricultural land. The weaknesses indicated above are applicable, in most instances, to classification undertaken for all types of land; but because of the extensive area involved in agricultural land use, weaknesses in classifications of this type of land tend to be especially noticeable.

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[52] For a more complete discussion of soil survey needs, see U. S. Department of Agriculture, *Soils and Men*, pp. 213–215.

The Future of Land Classification. Methods of classification have been devised for each of the nation's principal land resources. Some of these are more advanced in technique and coverage than others, but all have produced beneficial results and give promise of accomplishing important results in the future. The trend toward multiple and integrated use of land resources—forest, mineral, water, recreational, and agricultural resources particularly—is likely to increase the general interest in land classification.[53]

Local farmers, ranchers, and land operators throughout the nation are beginning to see the practical value of land classifications for adapting their land-use practices to the use capabilities of their lands, for assessing taxes more nearly in line with productivity, for getting their basic capitalized land values and overhead for lending and borrowing purposes more in line with productivity values, and for making possible more permanently sound and satisfactory use of land.

The increasing amount of physical and economic data becoming available through current programs indicates that continued improvement in agricultural land classification and the practical application of such classifications will become more and more widespread. Similar improvement and increased interest are found in other types of land use, particularly in forest, mineral, and recreational lands. Classification has long been recognized as fundamental to the most effective utilization of urban areas, where the zoning procedure was first used.

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[53] The National Resources Planning Board feels that the future will probably win a clearer understanding of the importance of securing adequate coverage in land classification projects within given time intervals, and that piecemeal classification, while it may help to improve methods and techniques, may fail to furnish the materials and understanding required for the development of land-use policies and programs. When this idea of adequate area coverage within a given period of time becomes more general, legislative bodies might allocate funds for land classification work on a long-time basis and thereby increase the utility of classification out of all proportion to the cost. (National Resources Planning Board, "Land Classification in the United States," p. 21.)

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CHAPTER THREE

THE DEMAND FOR LAND

THE demand for land arises from the various uses to which it can be put to satisfy man's wants. Man uses land resources directly for homesites, highways, or recreational purposes—or indirectly, in producing goods and services such as food, feed, fuel, and minerals. Land uses may be grouped into seven major use categories—agricultural, forest, mineral, water, recreational, transportation, and urban. Agriculture is by far the most important of the major uses, as far as the number of people directly engaged is concerned, at least 60 per cent of the world's population being engaged directly in cultivating the soil.[1] The proportion of the population engaged in agriculture varies greatly among the nations, however, and in the United States only approximately one-fifth of the people live on farms.

Man selects those land resources, or parts of them, which serve best in the production of economic goods and services to satisfy his wants. In this selection process, classification of land resources according to inherent physical characteristics and use capabilities, as indicated in the preceding chapter, is the first requisite for satisfactory land settlement and most efficient utilization. The character and amount of land selected for use, as well as the type and method of use, will depend not only on the size and trend of the population but upon its age composition, character, and distribution. The stage of civilization which a people has attained, particularly the stage of science, art, and invention (technology) will also have a very important bearing upon the demand for land.

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[1] Ellsworth Huntington, "Agricultural Productivity and Pressure of Population," *Annals of the American Academy of Political and Social Science*, vol. 198, July 1938, p. 74. Huntington goes on to say that if merchants, artisans, professional men, and others who serve the agricultural community are included, at least two-thirds of the world's population gets its living quite directly from agriculture, and that if miners, lumbermen, factory employees, transportation workers, and others producing and transporting goods consumed by the agricultural population are included, the number of people whose prosperity depends upon that of the farmer probably rises well above 80 per cent. All of us are fed, largely clothed, and to some extent sheltered by the direct or indirect products of agriculture.

FACTORS DETERMINING THE CHARACTER OF THE POPULATION

In more primitive societies, production is largely a matter of combining labor and land; but as civilization develops, capital is created by postponing consumption. A complex pattern of human institutions, customs, and social habits to form what is referred to as culture is built up through time, which in turn has an important influence upon the types and methods of utilizing land. We have, therefore, in modern complex society, three very important factors—available resources, the biological factor, and the cultural factor—which are closely interrelated and which determine the character of the population (its size, age composition, distribution, and related characteristics), which in turn determines the character and the amount of land selected for use, as well as the type and method of use.

The Land Factor. The character of the land resources ultimately determines the limits of population growth and largely conditions the distribution of the population. The physical fact of limited space and limited fertility, or producing ability, sets a limit to the increase of plant and animal life; but space limitations do not operate directly in the case of human beings, because other means of physical limitation become operative before space limitation is the deciding factor. The impossibility of obtaining food will operate long before there is "standing room only." In other words, the food supply operates to set the upper limits to the world's population.

Climate and weather have a very great influence upon the type of crops produced within a given area and the general utilization practices which will be followed, as well as an important influence in determining the density of population and the size and type of buildings and other improvements which will be made upon the land. Moreover, the climate has a very important effect upon the amount of food required. Basal metabolism seems to be from 5 to 15 per cent lower in the tropics than in the temperate climates, and a person requires a larger supply of food energy in a cold than in a warm climate.[2]

Throughout the greater part of human history, the abundance of game and the fertility of the soil have been the most important factors in determining the amount of population. River valleys have long been known for their fertility, and for their relatively large populations. On the other hand, dry land areas and mountainous country have always had a sparse population. Wherever the fertility of the soil or the state of the agricultural arts has produced a surplus of food and raw materials beyond the needs of the producers, towns and cities have developed; the proportion of people living in urban areas has always been determined "by the proportion of the agricultural production above that needed to maintain the farm population at or near a subsistence level. Always and everywhere man seems to have developed a town population as large as he could support."[3] This is typical of a progressive economy because with increased production efficiency accompanying modern science and technology, including division of labor, a decreased proportion of the total population is required to produce the needed food and fibers. This releases more people to produce non-agricultural goods and services that are in great demand in society with modern standards of living. Since man's total wants are practically limitless, as many of the population as are not needed to produce food and fiber pursue other occupations—industrial and professional—that characterize the urban community.

There have been tremendous changes in the amount and distribution of the world's population since the beginning of the Industrial Revolution. Europe and the areas settled by her people, which contained perhaps a sixth of the world's population in 1800, today contain a third or more. The proportion of the rural and urban populations in most of these countries has changed to an even larger degree, from as much as 93 per cent rural (people living in communities of less than 2500) in the United States, and 75 per cent or 80 per cent living in rural communities in western Europe, to 45 or 50 per cent in the United States today, and to only 20 per cent in France and England and Wales.[4] So great has been the effect of these forces that there is a tendency to disregard the important influences of the land factor in controlling the character of the population. Man, through his inventive genius and scientific advancement, has modified the part which the natural factors, including soil productivity, physical form of the land body, and climate, play in determining the amount and distribution of the population. However, in the marginal areas, or in the near-marginal regions, the land factor plays a very significant role, and even in the more productive and strategic areas the land factor plays a role of general conditioner too frequently overlooked or underrated.

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[2] Carl L. Alsberg, "The Food Supply and the Migration Process," in Isaiah Bowman (ed.), *Limits of Land Settlement*, Council on Foreign Relations, 1937, p. 30.

[3] Warren S. Thompson, "The Distribution of Population," *Annals of the American Academy of Political and Social Science*, November 1936, p. 250.

The Biological Factor. In 1798, Thomas Robert Malthus published an *Essay on the Principles of Population,* in which he argued that the population tends to outrun the food supply.[5] Malthus argued that population tends to increase in a geometric ratio, while food supply or subsistence tends to increase in an arithmetic ratio. Malthus based his conclusions upon conditions in the United States, where the population had doubled every twenty-five years, a rate of growth which Malthus believed represented the "natural increase of people." His theory implied that in a relatively short time, unless man practiced self-restraint, and other positive checks came into play, pressure of population on food supply would be very great and starvation, pestilence, war, or some similar developments would occur to reduce population to numbers in keeping with the food supply.

Malthus' formulation has been the one around which discussion of population has centered since the publication of his *Essay.* It is a bold, dogmatic statement of the biological concept of population growth; and while it contains an essential truth, it is not tenable as a general theory of population.[6] If one accepts the theory without qualification, the biological inevitability of human population increasing up to the limit of subsistence exonerates the wealthy or more fortunate groups in society from responsibility for existing social ills, poverty, war, disease, and pestilence.[7]

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[4] This tremendous shift has resulted from increased agricultural production per man-hour, the opening up of new and fertile lands in various parts of the world, the inventions of steam engines and machinery and techniques which made it possible for man to turn out useful manufactured products, the discovery and utilization of rich mineral resources, and other important social and economic factors. (*Ibid.,* p. 251.)

[5] T. R. Malthus, *Essay on the Principles of Population,* Dent, 1st ed., 1798.

[6] E. B. Reuter, *Population Problems,* Lippincott, rev. ed., 1940, p. 169. Reuter states that "Adequately and sympathetically interpreted, most of Malthus' 'Essay' can be made to appear true, or at least innocuous."

Malthus held that "population invariably increases, where the means of subsistence increase," adding "unless prevented by some very powerful and objective checks." Modern societies demonstrate conclusively that human populations are able to create and maintain powerful checks upon the biological urge to reproduce. For example, the sex appetite is a biological fact, but the reproductive tendency, as shown by the birth rate, is a cultural phenomenon and the development of birth control methods, self-restraint, fear of poverty, desire for a high standard of living, and related factors have enabled man to slow up the rate of increase to such an extent that in some modern nations populations have reached a stationary state, or, in some cases, have actually begun to decline. In other words, man does not act under biological influences only, and the growth in number of human beings in many parts of the world is due, at least to a considerable extent, to voluntary control. About half of the human race, made up largely of the Chinese and the Asiatic Indians, is pushing its population growth to the absolute limit of subsistence.[8] However, within the western societies, the more advanced groups desire a greater amount of material goods and services for each person, so that they restrict their families even though there is still a greater store of subsistence available to support a much larger population on a lower material level of living.

Pearl argues that population growth, like all growth, is fundamentally a biological matter. This means that "human populations grow according to the same law as do the experimental populations of lower organisms, and in turn as do individual plants and animals in body size."[9]

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[7] Reuter states that "The privileged classes of England, possessing most of the land and living in luxury among a miserable and starving peasantry, were seduced by a theory, irrelevant as it was to the subject, which seemed to exonerate them from all responsibility for the deplorable social conditions . . . but withal it was highly flattering to the property-owning classes: They were what they were, prosperous and property-owning, because they had the virtues the peasants lacked." (*Ibid.*, p. 167.)

[8] Lyman Bryson, "Population and Culture," *Annals of the American Academy of Political and Social Science*, July 1932, p. 190.

[9] Raymond Pearl, *Biology of Population Growth,* Knopf, 1925, p. 208.

The law of population growth, according to Pearl, is briefly as follows: Growth occurs in cycles, and in a spatially limited area or universe, growth in the first half of a cycle starts slowly but the absolute increment per unit of time increases steadily until the midpoint of the cycle is reached. After that point, the increase in population growth per unit of time becomes steadily smaller until the end of the cycle. The results, when plotted on a graph, form an "S" curve, or what is frequently referred to as a "logistic" or "sigmoid" curve. In a spatially limited universe, the amount of increase in any particular unit of time at any point of the single cycle of growth is proportional to two things—(1) the absolute size already attained at the beginning of the unit interval under consideration, and (2) the amount still unused or unexpended in the given universe of actual and potential resources for the support of growth.

In the case of human population growth, the unused and unexploited store of resources and subsistence will include such things as the amount of agricultural land still uncultivated or not farmed to the maximum of its productivity; new discoveries of improved agricultural production techniques; chemical methods of making foods synthetically or of adding plant nutrients to the soil to increase yields; military conquest; potential development of improved transportation facilities; development of power resources; reclamation, irrigation, and drainage to bring new lands into production; and similar factors. The result of these factors is to raise the upper limit of the population attainable in the current growth cycle, or, if the potential addition is larger, to start the population off upon a new cycle of growth.

Pearl's logistic curve of population growth merely shows the trends which human populations will follow if there is no significant change in the actual or potential resources available for the support of population growth brought about by the various factors indicated. Insofar as these factors will bring about significant changes in the actual and potential resources available for the support of human growth in most nations, with existing dynamic conditions, it is difficult to predict on the basis of the logistic curve just what the most likely future population of any given nation will be at various dates. In cases where significant changes are brought about by these factors, the entire problem of population growth must be reconsidered in the light of these changed conditions; but if no alterations occur before the completion of the present cycle of growth, maximum populations in this cycle can be determined for each of the principal nations.[10]

The Cultural Factor. Apparently in some societies the biological factors predominate, while in others they are much more in the background. It would seem apparent, therefore, that amount and distribution of population are determined partly by the physical limitations of the land resources, partly by biological forces, and partly by the cultural pattern, including social usages, institutions, economic organization, technology, and related cultural forces. Ross estimates that the "advanced societies," including perhaps a sixth of the human race, have applied "a brake to their fertility,"[11] and have so modified the influence of the biological factor that numbers are not allowed to increase to the absolute limit of subsistence.

Bryson indicates three distinct stages of cultures—(1) economic stringency in which both luxuries and necessities (all the elements of subsistence) are hard to get; (2) relative cheapness of the more necessary things, such as simple food, clothing, and shelter, but great scarcity and expensiveness of secondary elements or luxuries; (3) increasing expensiveness of necessities and relative cheapness of luxuries.[12] The logistic curve of population growth begins in the second stage, for various reasons. Fewer children die of starvation and malnutrition; parents are better fed and can both produce and care for more children; what is more, in the second stage children are economic assets because they are cheap labor. Education is beyond reach; more than simple comfort is impossible; and forms of vanity are not easily indulged. In the third stage, however, a relatively high standard of living has been established, and its effect is to slow up population growth (or to flatten out the curve) rather than to encourage it.[13]

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[10] *Ibid.*, pp. 22–24. Pearl in 1925 estimated the maximum population of the United States in this cycle will be 197.3 millions, if no alterations in the actual and potential resources for the support of population growth brought about by the factors mentioned occur before the completion of the present cycle of growth. Pearl indicates that the rate of reproduction or fertility is negatively correlated with density of population, and that apparently the direct and indirect biological effects of density of population upon reproduction constitute the major cause for the "damping off" of the growth of population as the upper limit of the logistic curve is aproached. Thompson and Whelpton have made estimates of the future U. S. population based on various combinations of assumptions with respect to the course of fertility, mortality, and immigration. They estimate the U. S. population will be 198,561,000 in the year 2000, assuming high fertility, medium mortality, and net immigration of 100,000 per year, beginning in 1945. This is their most optimistic estimate. Assuming medium fertility, medium mortality, and net immigration of 100,000 people, beginning in 1945, they estimate U. S. population will reach its peak with 167,000,000 around 1990 or 1995 and decline thereafter. Assuming low fertility, low mortality, and no net immigration, they forecast U. S. population will reach its peak in 1975 with approximately 154,000,000, and decline thereafter to 141,000,000 in the year 2000, compared with the estimated 1950 population of approximately 144,000,000. W. S. Thompson and P. K. Whelpton, *Estimates of Future Population of the U. S., 1940–2000,* National Resources Planning Board, Government Printing Office, 1943, p. 29.

[11] E. A. Ross, *Standing Room Only?* Century, 1927, p. 5.

Modern man eats for the pleasure of taste, and not merely to satisfy hunger; or he builds a large mansion to impress his fellow men, not merely to provide himself with shelter. Of course, it is true that the only way of enjoying the artistic pleasures of taste in food is to fill one's stomach, which is a "biological drag."[14] It would seem, therefore, that population growth is not entirely biological but is rather the result of two factors—physiology and psychology—acting together. Obviously, the more culturally mature the society the greater will be the part played by cultural forces, and the less culturally mature the society the greater will be the part played by biological forces. The complex problems of human population cannot be reduced to the simple Darwinian explanation of the adjustment of the lower animals to their environment. Man, by his cultural development, has gone beyond the biological phases of the problem and has established adaptative processes through which he has overcome the "inevitable" consequences of population pressing upon the means of subsistence.

POPULATION AND LAND SETTLEMENT

The word "population" ordinarily refers to the number of people inhabiting a given area, or "any group of people bound together with some degree of permanence in time and space, when the emphasis is upon the numbers rather than upon the social organization."[15] The characteristics of the population, including growth,

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[12] Bryson, *op. cit.*, p. 193.
[13] *Ibid.*, p. 195.
[14] *Ibid.*, p. 195.
[15] Reuter, *op. cit.*, p. 3.

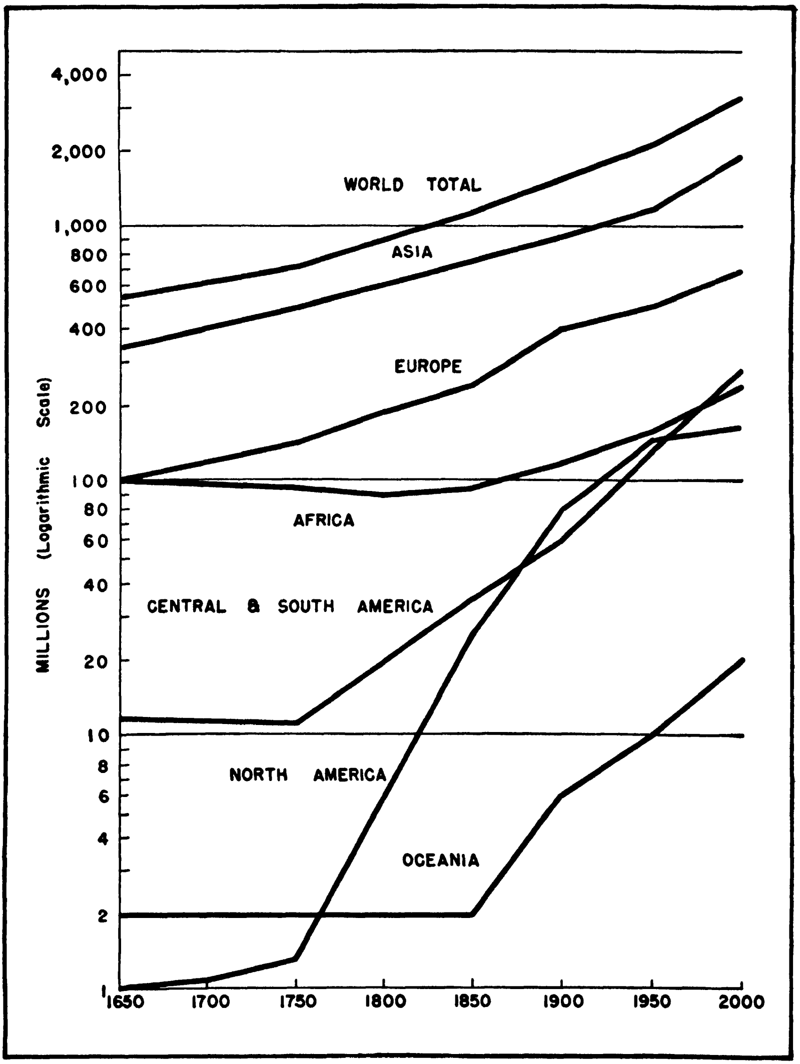

FIGURE 6. Growth of Population by Continents, 1650–2000. (Data for 1650–1900 from A. M. Carr-Saunders, *World Population*, p. 42; 1900–1940 data based on League of Nations, World Economic Survey, 1938–39; and *Statistical Yearbook*, 1938–39; projected data, 1940-2000, adapted from F. W. Notestein, "Population, the Long View," in T. W. Schultz (ed.), *Food for the World*, University of Chicago Press, 1945, pp. 36–57.)

density, age composition, and distribution, as well as total number, are directly and indirectly related to most of the major problems of economic and social life and are of special significance in determining the utilization of land resources. Growth is one of the principal factors of cultural change. Increase in population numbers and density forces men into new relationships with the land and with their fellow men. The standard of living, the nature of political and social institutions, etc., are conditioned by and in turn condition the character of the population for which land resources are utilized to furnish goods and services.

Total Population. The number of people is not an accurate measure of the importance of the population in determining the amount and character of land used or methods followed in the use of land resources. Numbers combined with cultural development or stage of technological attainment and the trend of population, rather than present population status, are significant. A population growing rapidly influences the wants, arts, and institutions developed by man in a way significantly different from that in which a stagnant, slow-growing, or declining population affects them, and consequently results in different land utilization.

Available population statistics for many countries are estimates, at best. If the reported population can safely be said not to exceed nor be less than the actual number of inhabitants by more than ten per cent, it can be said that the present population is known for all countries of Europe, North America, and Oceania, and for many countries of South and Central America and some countries of Asia and Africa. Countries for which, by this standard, the population is not known have at present probably a third or a fourth of the world's population.[16] Many careful studies have been made of population numbers and trends in most of the leading nations in recent years, so that data showing estimated population of the earth and of each of its continents are considered today to be fairly close approximations of the actual population.

The estimated total population of the earth is about 2,150,000,000.[17] More than half of this number live in Asia, and another fourth in Europe, or more than three-fourths in these two continents (see

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[16] R. R. Kuczinsky, "Population," in *Encyclopædia of the Social Sciences*, vol. VI, p. 240.

[17] The population of the world in 1937 was estimated at 2,126,000,000. (League of Nations, *World Economic Survey, 1938–39*, 1939, p. 143; and League of Nations, *Statistical Yearbook, 1938–39*, Table II, p. 19.)

Figure 6). Approximately one-twelfth live in North America, and nearly this same number in Africa; and the remaining five per cent live in South America and Oceania (only one-half of one per cent in Oceania).[18] In other words, only about one-eighth of the world's population lives in the Western Hemisphere (the Americas). Stated differently, the total population of the Americas is approximately half that of Europe, and less than a fourth that of Asia.

Population Density. The distribution of the people of the earth in relation to the land surface varies greatly among the continents (see Figure 7). In Europe there are 136 people per square mile, and in Asia 69 people per square mile, compared with only 21 in North America, 13 in Africa, 13 in South America,[19] and 3 in Oceania. That is, there are more than ten times as many people per square mile, on the average, for the entire continent of Europe (including European Russia) than there are in the continent of Africa or the continent of South America, and nearly seven times as many as in the continent of North America and approximately 45 times as many per square mile as in Oceania. Asia, the next most densely populated continent, has more than five times as many people per square mile as either Africa or South America, more than three times the population density of North America, and more than twenty times the population density of Oceania. The density of population also varies greatly among nations within the continents. In North America, the population density varies from 42 people per square mile in the United States to 25 in Mexico and only 3 in Canada. Moreover, within the United States, the population density varies greatly among major divisions or regions, as well as among the states (refer to Figure 7). The very heavy population density of the continent of Europe is associated with the highly industrialized urban areas built upon far-flung commercial and international trade. The comparatively high population density of Asia is associated with the low level of living of the millions of agricultural Chinese and the inhabitants of India.

The population density per square mile has considerable influence upon the type and intensiveness of land resource utilization; but it does not necessarily indicate the levels of living achieved by the people. There are sparsely settled areas where levels of living are very low, and there are also densely populated areas where people live in squalor and poverty. There are, however, other very densely populated areas where a high level of living is maintained. In other words, an area with a high population density may indicate overpopulation, but even an area with a low population density may be overpopulated.

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[18] The population of the earth, by continents, in millions, is approximately as follows: Asia, 1159.6; Europe, 530.4; North America, 181.65; Africa, 153.6; South America, 89.7; and Oceania, 10.57, or a total of 2125.6. (Compiled from League of Nations, *Statistical Yearbook*, *op. cit.*, pp. 13–22.

[19] Africa has 13.1 people per square mile, and South America has 12.7, so that actually the continent of Africa is more densely populated than the continent of South America.

The Man-Land Ratio. The man-land ratio, which takes into account all the human qualities bearing on productivity and all environmental aspects, both natural and cultural, affecting the availability of resources, is a much better indication of significant relationships between man and land than population density, and the two should not be confused.[20]

The relationship between the capacity of land resources to satisfy human wants, and the size, distribution, and trend of the population differs greatly in various parts of the world. In more primitive societies, where arts and standards of living are comparatively static, the relationship between human carrying capacity of the land (capacity to support human life) and demands made upon the land by the population can be quite easily appraised; but in more modern civilizations, with complex institutional organization and advancing technology, trade, industry, and commerce, the appraisal is difficult. When the form of land utilization is largely agricultural, as in more primitive areas, acres or square miles of area indicate human carrying capacity to a large degree, at least under similar conditions. In modern times, extensive use made of subsoil minerals and concentration of these deposits in certain strategic locations make carrying capacity of some areas much greater than that of others. Moreover, in determining human carrying capacity for a given nation, one must consider the area with which the nation trades as part of its area. Holland's population is almost double the estimated internal carrying capacity of the nation's area; but the human carrying capacity of the Netherlands must include, in addition to the land on the continent of Europe, much of the Dutch East Indies and many other areas of the earth on which because of her political,

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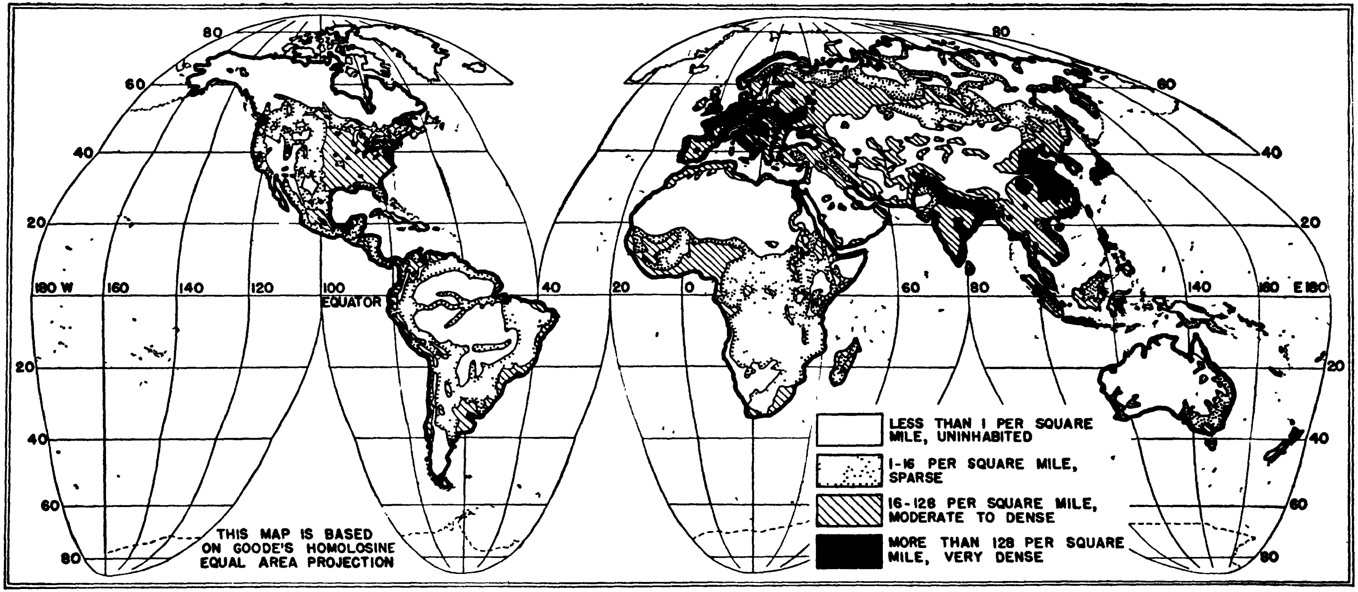
[20] Cf. Erich W. Zimmermann, *World Resources and Industries,* Harper, 1933, p. 123.


80
60
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THIS MAP IS BASED ON GOODE'S HOMOLOSINE EQUAL AREA PROJECTION
LESS THAN 1 PER SQUARE MILE, UNINHABITED
1-16 PER SQUARE MILE, SPARSE
16-128 PER SQUARE MILE, MODERATE TO DENSE
MORE THAN 128 PER SQUARE MILE, VERY DENSE

FIGURE 7. World Population Density. (Adapted from Wellington D. Jones and Derwent S. Whittlesey, *An Introduction to Economic Geography,* University of Chicago Press, 1925, Figure 8.)

commercial, and financial position prior to World War II she was able to draw for support.[21]

Population Pressure. The term "population pressure" is not synonymous with mere numbers or density. Densely populated nations such as India or China have not been, in modern times, driven to aggressive warfare by population pressure. "Pressure of population," in the modern sense, cannot be limited to the direct pressure of the population on the means of subsistence. This direct pressure constitutes the simpler and historic cases, and results in the so-called "hunger" wars where populations are confronted with famine. because of drought or flood or other natural catastrophes. The three alternatives available to such populations are death by starvation, peaceful migration where available territory makes such migration possible, and invasion of a neighboring territory.[22] In many cases, the last alternative has been chosen, particularly in earlier times when nomadic herdsmen invaded adjacent regions.

Modern "pressure of population" differs greatly from these so-called "hunger" pressures. Nomadic herdsmen fought for new feeding grounds; agricultural peoples fought for new lands; but modern industrial peoples fight for markets, for sources of raw materials, and for opportunities for investment of capital. They fight not to prevent starvation but to safeguard and improve a level of living to which they have become accustomed, or a standard to which they aspire—hence the modern scramble, through aggressive warfare, for "spheres of influence." A combination of large numbers of people, although the population density may not be abnormally high, and a high standard of living make population pressure more real than it could possibly be in the case of nations with large numbers and relatively low standards of living. In other words, population pressure becomes economic pressure, and instead of being a matter of mere density or numbers, it takes on certain psychological aspects.

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[21] Zimmermann refers to such populations as "expansive" compared with "pent up" populations which are unable to draw upon external carrying capacity, either economically or politically, and are led either to birth control, infanticide, or to chronic undernourishment if not starvation, or both. The expansionist populations, not content to live on their own resources, may draw on external carrying capacity through trade, conquest, colonization, commercial or financial penetration, etc. (*Ibid.*, pp. 124–125.)

[22] F. H. Hankins, "Pressure of Population as a Cause of War," *Annals of the American Academy of Political and Social Science,* vol. 198, July 1938, p. 103.

The feeling of population pressure does not vary directly with the difficulty of securing mere subsistence, but instead with the extent of the disparity between the goods and services actually obtained and those needed to satisfy the prevalent notion of what constitutes an adequate or attainable living. Therefore, it is the *felt* population pressure, rather than the absolute, that causes a nation to resort to aggressive warfare. Among poverty-stricken populations, no matter how dense, psychological or felt pressure is consistently low. It reaches its maximum in a high-standard population with a well-integrated national life, when its standard of living is threatened or reduced by the economic policies, real or fancied, of other nations.

POPULATION TRENDS AND THE DEMAND FOR LAND

The rate of increase or decline of a population aside from immigration depends upon the number of births compared with the number of deaths. A high birth rate with high mortality rates may not be as significant in increasing the population as a somewhat lower birth rate and a significantly lower death rate.

The Trend of Birth and Death Rates. The world's population has increased fourfold since 1650 and has more than doubled since 1800.[23] All sections of the world have participated in this growth (see Figure 6), but it was most pronounced prior to 1900, in Europe and European colonies or areas settled by Europeans. Since 1900 the rate of growth has tended to decline in North America, Europe, and Oceania, but in Africa, Asia, and Central and South America, although accurate data are not available, the rate of growth is apparently still increasing.

This increase in the world's population is due largely to a decline in death rates. For example, in the United States the expectation of life at birth has increased from about 34 years in 1879 to about 64 years today.[24] This is a gain of 30 years in two-thirds of a century. Other nations have made great progress in lowering death rates. New Zealand, Australia, and Sweden have surpassed the United

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[23] A. M. Carr-Saunders, *World Population, Clarendon Press*, 1936, p. 42.

[24] Based on average length of life among industrial policyholders of the Metropolitan Life Insurance Company. (Metropolitan Life Insurance Company, *Statistical Bulletin*, vol. 25, no. 8, August 1944, p 4.)

States.[25] In Europe, an era of peace and internal order after the middle of the seventeenth century followed by a series of agricultural innovations that greatly increased the food supply, which was further augmented by the tremendous resources of the New World, combined with industrial innovation that brought spectacular increases in production, and sanitary and medical advances, brought rising levels of living, new controls over disease, and reduced mortality.[26] In Africa, Asia outside the Soviet Union, and Japan, Oceania, and much of Central and South America, death rates, although declining are still high.

Looking ahead, death rates should continue to decline in the United States, Europe, and in other nations under the influence of western civilization. Thompson and Whelpton of the Scripps Foundation estimate that the actual life expectancy of native whites in the United States in 1980 will be around 69 years for males and 71 years for females.[27] With sanitary and medical advances and the expanding influence of western civilization growing out of World War II, it is logical to expect appreciable reductions in death rates in those countries where mortality is now highest.

There has been an almost universal reduction in birth rates since the turn of the century, and in many countries, particularly those in northwest Europe, North America, Australia, and New Zealand, this decline began in the latter part of the nineteenth century. By the end of the interwar period in nearly all the nations of northwestern and central Europe, birth rates had fallen substantially below the level required for permanent maintenance of a stationary population at existing levels of mortality.[28] In the United States, birth rates in 1800 were about three and one-half times as large as in 1930, and as late as 1880 American women were twice as prolific as today.[29] Consequently, the rate of material increase of population has diminished in a majority of countries for which statistics are available. In some cases, the birth rate has declined to a level approaching or below that required to maintain a stationary population, and in France and Austria births had fallen below deaths by the outbreak of World War II, resulting in a decrease in population.[30] During World War II in many of the nations overrun by Nazi Germany and in others engaged in the war, birth rates tumbled still lower.[31]

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[25] National Resources Committee, *The Problems of a Changing Population*, Government Printing Office, 1938, p. 22.

[26] Cf. Frank W. Notestein, "Population—The Long View," in T. W. Schultz (ed.), *Food for the World*, University of Chicago Press, 1945, Part II, p. 39.

[27] National Resources Committee, *op. cit.*, p. 22.

[28] Notestein, *op. cit.*, p. 41.

[29] National Resources Committee, *op. cit.*, p. 23.

This decline in the birth rate is likely to modify profoundly the demand for land, particularly agricultural land, in the next few decades. In the case of the United States, the birth rate declined from more than 25 births per thousand persons, before the First World War, to less than 18 during the interwar period. Many leading nations experienced declines in the birth rate to record lows during 1932 and 1933, the worst years of the depression, and the rise since these years has been comparatively slight, except for the flurry associated with World War II.[32]

The full price of World War II in terms of birth deficits will not be paid until long after the war. The effect of wars on the birth rate is frequently a greater menace to population growth than the actual military losses—the deficit of births in Europe excluding Russia, caused by the First World War, is estimated at over 12,000,000, or almost double the military losses.[33] There was a resurgence in birth rates in all the belligerent countries after the war, but this was temporary and in practically all nations the downward trend in evidence before the war was resumed after a year or two. Much the same situation will likely be experienced after World War II. It seems safe to conclude, therefore, that the western world faces a continuation of the long downward trend of birth rates for several decades unless there is prolonged economic prosperity and a fundamental change in popular attitudes concerning larger families. In the United States, the medium assumptions of Thompson and Whelpton forecast a decline of 13 per cent in the birth rate in the next 50 years.[34] However, if this estimated birth rate is not to prove too high there must be a rather rapid change in attitude concerning the desirability of three and four child families.

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[30] League of Nations, *Statistical Yearbook*, p. 145.

[31] For example in France, where the birth rate had already fallen below her death rate since 1935, the birth rate was only 14.6 per 1000 in 1938 and was further reduced to 13.0 by 1941. (A birth rate of 16.4 is necessary to maintain a stationary population whose average span of life is 61 years.) The experience of Belgium was even worse than that of France, and undoubtedly Poland, Yugoslavia, and Greece suffered sharp reductions in birth rates. In Italy the birth rate dropped 14 per cent from 1940 to 1942. The experience of England and the United States is quite different. In England, the birth rate declined 5 per cent from 1939 to its low point in 1941, but recovered in 1943 to the level of 15 years previous. (Louis I. Dublin, "War and the Birth Rate," *Statistical Bulletin*, Metropolitan Life Insurance Company, vol. XXV, no. 10, October 1944, p. 2.)

[32] The birth rate in the United States recovered slowly between 1933 and 1939, but beginning with 1940, the rate mounted rapidly, accelerated first by the sharp increase in industrial activity and then by the great increase in marriages in anticipation of the service draft. From 1939 to 1943 the birth rate increased 27 per cent and births exceeded 3,000,000 in 1943 (22 per 1000 population) or about one million more than during the bottom year of the depression thirties. (*Ibid.*)

[33] *Ibid.*, p. 1.

The Trend of Immigration. A third factor affecting the trend of population within a country along with birth and death rates is immigration. In the United States, immigration has been a major factor in the past in determining the size and composition of the nation's population. In some years immigration equaled 1.5 per cent of the population and exceeded the million mark annually in several years between 1900 and the outbreak of World War I. In recent years, however, immigration has been greatly reduced by laws and regulations and by unsettled economic and political conditions. The present quota law passed in 1924 permits 153,774 immigrants to enter annually from quota nations and sets no limits on the number that may come in from other countries. Congress may make these quotas more or less restrictive or the President and Secretary of Labor may relax or tighten the administrative regulations that limited immigration rigidly during the thirties. In view of these uncertainties it is impossible to make any intelligent predictions of the future effect of immigration. It can be assumed, however, that there will continue to be large numbers of persons desirous of taking up residence in this country and unless immigration is prohibited, its value will vary widely from year to year, depending principally on economic and political conditions here and abroad.[35]

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[34] This would mean each 1000 women living through the childbearing period would have about 1900 births, or slightly less than an average of two births for all women and slightly over two and one-half for fertile women. This is approximately the 1930 rate in Massachusetts, Connecticut, Washington, Oregon, and also in Sweden. (National Resources Commitee, *op. cit.*, p. 23.)

[35] During the five year period 1939 to 1943, quota immigrants averaged 43,065 per year and non-quota immigrants 34,852, or an average total of 77,917 yearly. The excess of all arrivals into the country of all classes over departures of all classes from the country averaged about 70,000 per year during the five year period. (Compiled from U. S. Department of Commerce, *Statistical Abstract of the United States, 1943*, Bureau of the Census, Government Printing Office, 1944, pp. 107-108.)

The Trend of Population. A population may for a time sustain or even increase its numbers by a balance of annual births over annual deaths, and yet be failing to reproduce itself. Thus, although births still exceed deaths in nearly every country, the population has actually ceased to reproduce itself in many nations. This apparent paradox is due to the fact that the age distribution may be temporarily abnormal, and a population which fir any temporary reason contains a large proportion of women in the reproductive ages, and a small proportion of infants or old persons, will show a low death rate and a high birth rate. But as the persons in the reproductive ages grow older and mortality and fertility remain constant, such a population will soon show birth and death rates drawing apart. Many nations, particularly in western Europe, have populations which at present contain a small proportion of old and young persons and a high proportion of persons in the reproductive ages, due to the fact that the birth rate was high in past years and has recently declined.

In the United States, the birth rate still exceeds the death rate, and will undoubtedly continue to do so for some time, because of the present comparatively large proportion of persons of child bearing age. However, in the future the proportion of old persons may be expected to increase considerably as the high proportion of persons now in the reproductive ages grows older, with the result that births are likely to fall and deaths to rise to such an extent that the total population will decline.

Notestein groups the world's population into three demographic types.[36] I. *Incipient Decline*—Populations in which fertility has fallen below the replacement level or those in which it is near and rapidly approaching that level. Populations of northwestern, southern, and central Europe, North America, Australia, and New Zealand are all in this group. Only immigration or reversal of recent trends in fertility[37] can prevent virtual termination of growth in this group within a generation, but such reversals will be difficult to obtain short of drastic governmental policies. II. *Transitional Growth*—Populations in which the decline of both fertility and mortality is well established but in which the decline of mortality precedes that of fertility and produces rapid growth. Populations of eastern Europe are nearing the end of this stage, those of Soviet Russia and Japan and certain Latin American countries are in mid-course, while those of Turkey, Palestine, and parts of North America apparently are entering it. III. *High Growth Potential*—Death and birth rates remain close to pre-modern standards and birth rates have hardly begun to decline. This type includes more than half of the world's population. Egypt, Central Africa, much of the Near East, practically all of Asia excluding Soviet Russia and Japan, the islands of the Pacific and Caribbean, and much of Central and South America fall in this type. If political or economic conditions are bad for prolonged periods in these areas considerable depopulation might result, but if a prolonged period of peace and order prevails and production efficiency increases, there would probably be rapid and sustained population growth.

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[36] Notestein, *op. cit.*, pp. 41–52.

[37] *Fertility* is the number of births per 1000 women of childbearing age, this age being assumed to constitute the period from 15 to 50 years.

On the basis of this classification of the world's population, it is obvious that populations where fertility has been brought under control enough so that birth rates are in balance with the low death rates permitted by modern conditions are definitely in the minority. Consequently, total world population will continue to increase and may exceed three billions by the year 2000.[38] If by that time fertility is to fall enough to bring about the end of the period of growth, there must be great advances in production and political and social organization. In other words, food output must increase faster than population, and there must be equally rapid advancement in industrial production, education, public health, and government; because it is only when rising levels of living, improved health, and increasing education give new life, value, and dignity to individual life that old customs are discarded and fertility comes under control.[39]

United States population has for many years been growing more and more slowly. The decennial rate of increase was above 30 per cent for most of the nineteenth century, declined to around 20 per cent at the turn of the century, and was only about 7 per cent for the most recent intercensal period, 1930 to 1940 (see Table 1). With current trends of fertility and mortality (see Figure 8), the outlook is for a low rate of increase for the next few decades with ultimate stabilization or even decrease in numbers, unless heavy immigration is resumed. Assuming medium fertility and mortality, Thompson

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[38] Notestein indicates there is considerable chance that the world will reach the three billion level in two generations, with the capacity for growth of its backward populations still unimpaired. (Notestein, *op. cit.*, p. 57.)

[39] Cf. *ibid.*

TABLE 1. United States Population, Amount and Per Cent of Increase by Decades, 1650-1950

Year	Population (Thousands)	Increase (Thousands)	Decennial Per Cent Increase
1650	52	—	—
1660	85	33	64.0
1670	114	30	35.0
1680	156	41	35.9
1690	214	58	37.2
1700	275	62	28.8
1710	358	82	30.0
1720	474	117	32.7
1730	655	181	38.1
1740	889	234	35.7
1750	1,207	318	35.8
1760	1,610	403	33.4
1770	2,205	595	37.0
1780	2,781	576	26.1
1790	3,929	1,148	41.3
1800	5,308	1,379	35.1
1810	7,240	1,931	36.4
1820	9,638	2,399	33.1
1830	12,866	3,288	33.5
1840	17,069	4,203	32.7
1850	23,260	6,191	36.3
1860	31,502	8,242	35.4
1870	39,904	8,402	26.7
1880	50,262	10,358	26.0
1890	63,056	12,794	25.5
1900	76,129	13,073	20.7
1910	92,267	16,138	21.2
1920	107,190	14,923	16.2
1930	123,091	15,901	14.8
1940	131,669	8,578	7.0
1950	141,645[a]	9,976	7.0

[a] Estimated on basis of medium mortality, medium fertility, and annual net immigration after 1940 of 100,000.

Source: National Resources Committee, *The Problems of A Changing Population,* Government Printing Office, 1938, pp. 21 and 24; and U. S. Department of Commerce, Bureau of the Census, *16th Census of the United States (1940)*, vol. II, chap. I, Table 4.

and Whelpton estimate that without immigration, the United States population will grow to about 151 million in 1960. A further increase of only 9 million is anticipated during the two decades, 1960 to 1980. Shortly after this the favorable age composition carried over from the earlier period of higher birth rates will have run out and a decline of numbers is anticipated after 1985.[40]

Causes of Downward Trend in Population. Before the First World War, most nations considered a large and increasing population a desirable economic asset. Rising standards of living and general prosperity in countries like the United States, Germany, and Great Britain were associated with increasing numbers of people, such increases being considered necessary for development of natural resources and for general business and industrial expansion. However, maladjustments set in motion by the disrupting influences of World War I and the unemployment, poverty, and social unrest of the two decades following reversed the emphasis and much talk of overpopulation was heard. The desire for high standards of living in many nations, coupled with the growth of urbanization accompanying advancing technology and dissemination of birth-control information, brought about reductions in size of families.

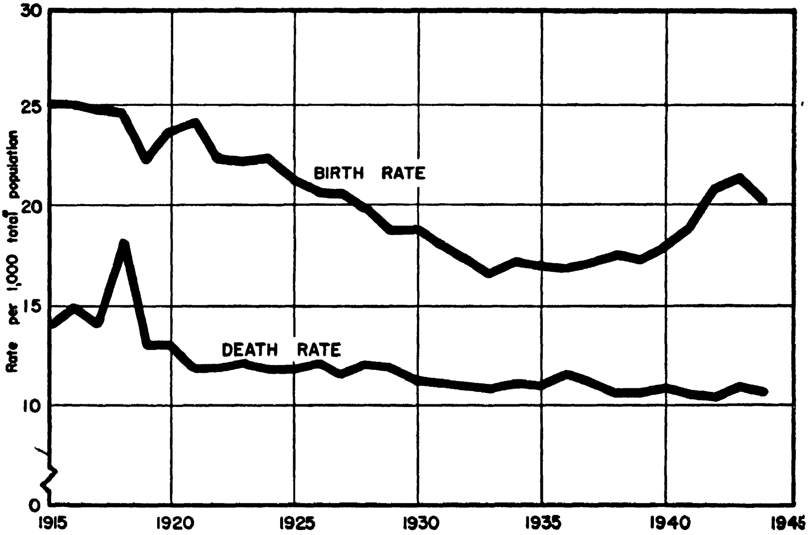

FIGURE 8. United States Birth and Death Rates, 1915–1945. (Source: U. S. Department of Commerce, Bureau of the Census.)

In the case of the United States, restrictions on immigration have also contributed to declining birth rates, because foreign immigrants consisted primarily of young people from European peasant farms where the tradition of large families has persisted. Urbanization reduces birth rates because, among other things, children cost more in cities and are less of an economic advantage than children in farm areas. Even in farm communities birth rates have declined because of increasing costs and higher standards of living. Large families are no longer popular, not only because of the economic factor of cost involved[41] but also because of the social and other related inconveniences of rearing numerous children.

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[40] Thompson and Whelpton, *op. cit.*, p. 29.

Effects of Population Trends Upon the Demand for Land. A declining rate of increase of the population, or the approach of a stationary population, or a possible declining total population involve serious adjustments in the utilization of land for various purposes. However, current relationships between land resources and population should be considered. A country may be overpopulated or underpopulated, and consequently a change in the size of the population may actually help to raise the level of living. If it is a case of underpopulation, each of the above three situations would tend to reduce still further the level of living, while an increase in population would be beneficial. However, if the nation is overpopulated, any of the above three population situations would tend to raise the standard of living. A second factor to consider is the rate of change, because the change in rate of increase or rate of decline will have certain economic consequences quite apart from the question of whether the country is overpopulated or underpopulated. The third important factor which should be considered is the age composition of the population, which will have important economic significance.

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[41] "Dr. Dublin, statistician of the Metropolitan Life Insurance Company, estimated a few years ago, on the basis of thousands of family budgets, that for a family in the large cities, having an aggregate income of $2500 . . . the cost of raising a child to the age of 18 was about $7500, or more than $10,000, if interest on the investment be allowed. This estimate excludes the cost of education paid from the public purse . . . Three children per fertile family, which is the number necessary to maintain even a stationary population . . . means an investment, therefore, of $25,000 to $30,000 for the average city dweller (at pre-depression prices), and of probably only a third as much for the farmer." (O. E. Baker, "Rural-Urban Migration and the National Welfare," *Annals of the Association of American Geographers*, vol. III, June 1933, pp. 99–100. Dr. Baker refers to Louis I. Dublin, *The Money Value of a Man,* 1930, p. 37, as the source of his statistical material.) The figure of one-third which Dr. Baker implies is the relative cost of raising a child on the farm, compared with the cost in the city, is undoubtedly much too small today, with the increased commercialization of American farming.

The change from a rising to a declining population will have important economic effects upon the amount of land used and the methods of utilizing it. A large amount of capital construction has occurred in the nations included in demographic type I—*Incipient Decline,* simply because of the growth of population. The demand for schoolhouses and school sites is dependent primarily upon the number of children of school age. The demand for houses and urban lots is largely dependent upon the number of households which are being established; and the demand for industrial equipment may decline with a decline in the number of consumers, with the result that savings may exceed the demand for capital and necessitate lowering interest rates or increasing governmental expenditures to stimulate economic activity, in order to offset reduced demand. Declining population involves many shifts among industries and types of production, and such shifts are much more difficult for the average businessman or industrialist to make, as an individual operator, than the guiding of new labor or new capital into an expanding occupation accompanying increasing population. Economic adjustments are more difficult with stationary or declining population than with expanding population, which seems to create its own market and fit in normally with capitalistic economies.

Relation of Population to Type of Land Exploitation. There are important differences in the basic relation of population to economic resources in various parts of the United States. One of the most significant indices of these differences is distribution of gainful workers in three broad industry groups: (1) *extractive* (agriculture, mining, and forestry), (2) *mechanical and manufacturing,* and (3) *trade and service.* For the United States as a whole, the proportion of the total labor force engaged in extractive industries has declined steadily from over 45 per cent in 1880 to less than 20 per cent in 1940. During this same period the proportion engaged in manufacturing and mechanical industries increased from 20 to 30 per cent, and the proportion engaged in the distributive and service occupations rose from 34 to 50 per cent. These data indicate the transformation of the American economic system from one organized around the exploitation of natural resources to one in which major emphasis is on mechanical, managerial, professional, trade, and service functions. These trends have important implications for population redistribution.

Only in the southeast region of the United States do the extractive industries predominate compared with manufacturing and mechanical and distributive and service industries. Over the years agriculture has been relied upon as the chief source of employment in this region and the ratio of farm population to land in farms is much greater there than in any other region. The value of farm land per capita of farm population averages less than $500 in most counties in the southeast region, and perhaps in a third to two-fifths of these the average is less than $250, while in many of the corn belt counties the average is $3500 and over.[42] In this region the net value of agricultural products per year per agricultural worker is less than that in any other region, averaging about half that for the nation as a whole[43] The widespread and chronic poverty of this region is due basically to a high ratio of population to economic resources, rather than to racial composition of the population or the Civil War. The solution is either considerable emigration from the region or development of new economic opportunities within the region, or both.

In the northwest and southwest regions agriculture, mining, and forestry employ approximately as large a portion of the population as the distributive and service industries and considerably more than the manufacturing and mechanical industries. In all the other regions (northeast, middle states, and far west) the extractive industries employ considerably fewer workers than the manufacturing and mechanical and the distributive and service industries. In the northeast region nearly four times as many workers are employed in manufacturing and mechanical and nearly six times as many in distributive and service industries as in the extractive industries. In the middle states nearly twice as many workers are employed in manufacturing and mechanical and about 2½ times as many in distributive and service industries as in the extractive industries; in the Far West half again as many are in manufacturing and mechanical and nearly four times as many in distributive and service occupations as are in the extractive industries.

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[42] There is no completely satisfactory measure of absolute agricultural land resources in the United States because of the great variety of existing soils and crops. The National Resources Committee used the relationship of farm population to land values as a fairly satisfactory measure of the relation of farm population to "economic resources." Economic resources in this sense include social factors such as demand for farm products in different regions. (National Resources Committee, *Problems of a Changing Population*, p. 55.)

[43] The net value of agricultural products per year per agricultural worker is also relatively low in the northeast region where the ratio of population to economic resources as measured by value of farm land per capita of the farm population is relatively high. However, density of farm population, even when measured on this basis, has a much different meaning in the vicinity of large cities characteristic of the Northeast than in more predominantly rural areas. Near cities there is more likelihood that farmers have supplemental occupations and incomes and also that farms are used for retirement or recreation.

Agriculture is by far the most important of the extractive industries in the United States, more than 9 million workers being engaged in farming in 1940, compared with only a little more than a million in mining and approximately 137 thousand in forestry (excluding logging) and fishing. All the extractive industries create similar population problems. All are based on the direct exploitation of natural resources; all are characterized by scattered settlement while workers in manufacturing and mechanical and distributive and service occupations live in large cities or urban communities. Workers in extractive industries have fewer alternative opportunities for employment available to them than people in urban communities. Also, they tend to have less mobility than people in cities.

Agricultural populations of the various regions of the United States vary greatly in density. In the winter and spring wheat belts of the Middle West and Northern Plains states, grain crops are grown usually on comparatively large land holdings, with much use of machinery. In the range areas of the western states, holdings are large and farm population sparse. Ordinarily, however, crops are raised in the intermediate latitudes characteristic of the United States on relatively small farms, with rather widespread use of labor-saving machinery. In general, the farm populations are of moderate density and the population pattern relatively small. Production conditions are very different from those of the tropical plantation and of Oriental agriculture. The plantation type of agriculture makes for both a fixed and denser population than is possible with primitive exploitation of the soil with native use, but it is less dense than that under the Oriental system of intensive cultivation.

Workers in forestry or mining, living in small settlements, face serious problems when the nearby mill or mine which is their only source of employment closes down because of exhaustion of the raw material or for some other reason. Stranded communities are more common in lumbering and mining than in other industries. Where mining is the sole basis of support, density of population may vary from sparse to above average depending on the kind, size, accessibility, and related characteristics of the mineral deposit. Lumbering and forest industries are ordinarily of only temporary importance, if conditions are favorable for profitable agriculture. Where slopes are steep, soils thin or poor, and climatic conditions unfavorable for cultivated crops, they may comprise major enterprises for a good many years. Where a combination of forestry and agriculture is possible, stability of population and better conditions of living for workers ordinarily result.

As population increases in density, increased specialization occurs, accompanied by progress which multiplies human wants so that trade of products for articles or materials which are not or cannot be produced locally becomes important. If power, labor, and other conditions are favorable, materials from other areas as well as those produced locally are available for fabrication, and manufacturing may become an important occupation. Great density of population characterizes industrial areas everywhere.

Manufacturing is relatively more important in the northeast than in any other region in the United States, the middle states ranking next. The only important industrial areas west of the Mississippi River are the Seattle-Tacoma area, the Los Angeles and San Francisco-Oakland area, and the Kansas City area.

The type of land utilization is of major significance to future trends in population distribution. The extractive industries have had the effect of scattering the nation's people, while trade and manufacturing and large scale commercial operations have brought them together again. Both movements have created serious national problems. The westward movement of lumbering, agriculture, and mining has created problems of soil depletion, erosion, and flood control. The development of industry has created urban problems associated with high density of population and has made city residents completely dependent on orderly operation of an involved industrial and commercial economy.

Recent studies indicate there is no marked tendency toward general dispersion of industry (movement of industries to scattered towns and villages outside the areas of industrial concentration) and that diffusion is less marked than is frequently supposed.[44] There seems little evidence to support the belief that opportunities for part-time or full-time industrial employment will be widely distributed geographically in the near future. Also, there is little evidence that there will be widespread development of combined industrial-farming employment, although there will undoubtedly be significant developments along these lines in certain favored communities.[45]

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[44] Carter Goodrich, *et al.*, *The Changing Pattern of Industrial Location*, University of Pennsylvania Press, 1936, chap. VII.

Peculiar Significance of Population Trends to Agricultural Land Utilization. The demand for agricultural products, particularly the basic foodstuffs, depends largely upon the size of the population, more than does the demand for many other products. There is a limit to the amount an individual can eat, while there is no such readily determinable saturation point in the case of industrial products growing out of an expanded technology. Consequently, unless there is an increase in population or, in other words, more mouths to feed, agriculture as a whole finds its market definitely limited, although certain types of agricultural products may find demand greater with changes in living standards accompanying a decline in population, while others will experience a great reduction in demand. Cessation of population growth will cause the demand for agricultural products to cease expanding, or at least to increase much more slowly. With application of agricultural inventions and improvements in farm techniques, agriculture in some farm areas will be threatened with overproduction and excess productive capacity. The difficulties experienced by American agriculture during the twenties and thirties, which were duplicated in many other nations, necessitated specific agricultural programs to relieve farmers and ranchers of depressing surpluses.

American farming is a good example of the agricultural significance of a stationary or a declining population. During the period of a century or more, production in the United States doubled about once every fifty years, and American farmers became accustomed to an increasing demand for food and fibers. When foreign markets shrink and domestic population declines, the number of farmers in many of the more productive agricultural areas tends to decline. This in turn tends to reduce the national birth rate still further, and the decreasing crop acreage affects the prosperity of many communities, both urban and rural. Reversion of crop land to pasture or forests, or to other less intensive uses, means fewer farmers, in most cases, to buy goods from the local merchant and to make use of the services of the local doctor, teacher, and lawyer. This means community abandonment, less property to tax for the support of schools and roads, with consequent tax increases in many areas, which in turn force more people to give up their land through tax delinquency and tax-deed foreclosure. This increases the tax rate and forces still more land tax delinqency. When population becomes stationary, the farmers in an area can still be fairly prosperous because of the reduction in expenditures for the support of schools. But when a nation's population, or the population of a community, is declining rapidly, it is much more difficult because of idle farm lands, unoccupied city houses, declining land values, insecure investments, and related consequences.[46] In other words, the general spirit of enterprise and individual initiative is likely to be sorely depressed, at least until fundamental adjustments in the economy can be effected.

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[45] Cf. National Resources Committee, *Problems of a Changing Population*, p. 73.

Not all the economic effects of a declining population are unfavorable, however, although the effects on agriculture are very serious. The changing age composition of populations in nations where the birth rate is declining will be in the direction of a larger proportion of people in the earning ages (20 to 65). This proportion will tend to increase for some years, and in itself should allow for an increase in real income per person, since there is a smaller proportion of idle dependents. However, the advantages from this situation will not be secured without intelligent planning and cooperation of economic groups within the nation, because difficulties associated with such changes in population and consequent shifts between occupations and production may create a situation of general chaos, waste, and increased unemployment.

Changing age composition of the population accompanying a declining birth rate will also have serious effects upon consumption of specific farm products. The United States population of the future will comprise a larger proportion of old persons, and a smaller proportion of children (see Figure 9). The central age groups will remain quite stable in total numbers, although with a shift toward the upper age limit. In terms of percentage the 65 and over portion of the population more than doubled from 3 per cent of the total population in 1870 to 6.8 per cent in 1940. Medium assumptions of fertility and mortality indicate the proportion 65 and over at the end of the century will be 13.2 per cent. In 1870, children under 5 years of age, constituted 14.3 per cent of the U. S. population. This declined to 8 per cent in 1940 and under medium assumptions of fertility and mortality will further decline to about 6 per cent at the end of the century.[47]

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[46] Cf. Baker, "Population Trends in Relation to Land Utilization," *Proceedings* of the Second International Conference of Agricultural Economists, 1930, p. 289. Although effects on agriculture accompanying the severe depression phase of the business cycle, especially like that of the thirties, are very similar in many respects, they should not be confused with conditions indicated here which accompany long-time population changes.

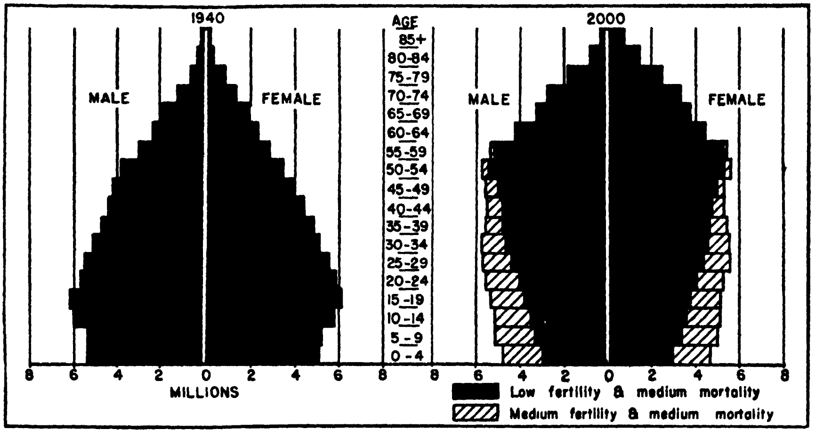

FIGURE 9. Age and Sex Distribution of United States Population, 1940 and Projected 2000. A pyramid representing a normal population would be a nearly perfect one, wide at the base, narrowing proportionally to a point at the top. The 1940 age distribution reflects the increased decline in the birth rate (a shrinking in the proportion of the population under 15 years of age). The projected age distribution for the year 2000 shows the effects of the declining birth rate assuming (a) low fertility and medium mortality, and (b) medium fertility and medium mortality. (Source: 1940 data from U. S. Department of Commerce, Bureau of the Census, 16th Census Report; projected data for the year 2000 from Thompson and Whelpton, *Estimates of Future Population of the United States*, National Resources Planning Board, 1943, pp. 68–69 and 92–94.

A population in which there is an increasingly large proportion in the older age groups will consume somewhat less of certain goods, such as dairy products, wheat, beef, sugar, and high energy foods in general, than a population in which there is a larger proportion in the younger age groups. Youth's diet is much different from that of grown-ups, and the decreasing birth rate will bring about significant shifts in the demand for various agricultural products. These shifts in dietary demands will have important effects upon utilization of land for agricultural purposes, because certain crops or products require many more acres to produce a given number of calories than others.[48]

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[47] Compiled from U. S. Census data and estimates by Thompson and Whelpton, *op. cit.*, p. 32.

General Effects of Population Trends Upon the Economy. A declining population will also have important effects upon the nature of business and economic activity outside the field of agriculture. The demand for semi-luxuries and luxuries (including wholesome non-essentials) relative to the demand for food and other such necessities should increase as population declines.[49] Consumers' urgent basic wants are the first to be satisfied, and the demand for goods and services to satisfy basic wants is much more predictable, regular, and reliable than the demand for luxuries and non-essentials which makes up an increasingly large proportion of total consumption, as the standard of living rises. In other words, the demand for an increasingly large proportion of products accompanying a rising standard of living and a declining population is more capricious and less stable and predictable than the demand for the goods and services which satisfy basic wants. This change in demand from the more stable to the less stable wants will have serious repercussions upon the entire economy, increasing the risk which the average businessman must take in operating his business. The entire economy will be more sensitive and more subject to wide swings from prosperity to depression and from depression to prosperity than when the basic wants and a lower general standard of living predominated. This increased sensitiveness will require new types and methods of social control, if equilibrium is to be maintained within the economy.

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[48] The yearly consumption of food per person averages 1,400,000 calories; and the following crop and pasture acres are required to produce 1,400,000 calories of the following foods: sugar beets, .28 crop acres, sugar cane, .34 crop acres; potatoes, .76 crop acres; corn meal, .79 crop acres, wheat flour, 1.45 crop acres; tomatoes, 1.47 crop acres; apples, 2.35 crop acres; pork and lard, 3.1 crop acres and 0.1 pasture acres; milk, 2.35 crop acres and 1.6 pasture acres; beef (dressed), 11.3 crop acres and 2.5 pasture acres. (O. E. Baker and L. C. Gray, "Land Utilization and the Farm Problem," U. S. Department of Agriculture, Miscellaneous Publication 97, 1930, p. 33.)

[49] Increasing scarcity of labor due to the declining birth rate relative to capital, equipment, and natural resources may lead to a rise in wages at the expense of incomes from property, and so result in a more equal distribution of income. This should tend to increase the demand for semi-luxuries or products other than basic necessities and conveniences. (League of Nations, *World Economic Survey, 1938–39,* pp. 157–158.)

OPTIMUM POPULATION—THE IDEAL MAN-LAND RATIO

The population trends which have been noted above will naturally affect resource appraisal. Whether the net result of these population changes and trends will be a better or worse land utilization pattern depends largely on the present relationship of population to resources in the various nations. Some countries are more overpopulated than others, but in every case the aim should be the best possible relationship between the supply of and the demand for land, or what might be termed an "ideal man-land ratio."

The Concept of Optimum Population, or the Ideal Man-Land Ratio. The ideal man-land ratio is often referred to as the "optimum population density," but the word "optimum," or "best," involves subjective appraisal and makes the concept of optimum population a difficult one upon which to secure general agreement and understanding. As Zimmermann points out, since what is best depends upon the basis of appraisal, there are numerous population optima. depending upon the yardstick the appraiser chooses.[50]

The determination of the ideal ratio between the number of people and the area and resources of the land they inhabit is the basic economic problem of land settlement and population. The ideal ratio, expressed in general terms, is that which will give the maximum of human welfare in a certain environment with a given state of development of culture.[51] If we assume that a maximum of creature comforts is worth seeking, the ideal ratio will be attained when ". . . whatever the methods of distribution, per capita production and per capita consumption are at the highest point attainable."[52] It has also been stated in terms of highest marginal output. If, however, the population of an area is so sparse that additional units will give a larger marginal return, the average output of the group will be raised by population increments beyond the point of highest marginal returns.[53] Some believe that maximization of human happiness is a logical ideal, to be served by all human instrumentalities and activities, although there are many who do not accept this concept.[54] Since welfare and happiness depend upon a great number of considerations other than number of people and quantity or character of economic resources, this concept of maximization of human happiness cannot be used as the criterion of an optimum relation between size of population and available resources. The concept of maximum economic welfare has similar limitations, for economic welfare includes production, distribution, and consumption of economic goods and services. If this concept were used as the standard to determine the optimum or ideal man-land ratio, the entire field of distribution and consumption, as well as production—in short, every major field of economic theory—would be involved in an adequate explanation of the ideal man-land ratio.

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[50] "To the painter, who sees beauty only in unspoiled nature, the optimum may lie very close to zero. The sociologist, who believes in Sumner's statement that civilization is a function of numbers in contact, may be inclined to put the point of optimum on a higher place on the population density scale. Again, the economist's optimum is apt to be found at a different point, especially when the economist consciously confines himself to purely utilitarian values." (Zimmermann, *op. cit.*, p. 136.)

[51] Cf. Reuter, *op. cit.*, p. 13.

[52] Glenn E. Hoover, "The Quantitative Optimum of Population," *Annals of the American Academy of Political and Social Science*, July 1932, p. 198.

Some writers believe that the primary problem of the ideal man-land ratio is one of securing the most efficient quantitative relationships of the factors of production, and that since production is primarily a technological process, "the optimum size of population will be that which furnishes the labor supply which, fully utilized, is necessary to operate the total resources of land, materials, and instrumental capital at the point of least (labor) cost per unit of product or income."[55] If the problem of the optimum population or ideal man-land ratio is regarded as an aspect of the theory of production, and the ideal ratio is considered as that number of people which will operate productive resources most effectively, measured in product per capita or per unit of labor utilized, it is obvious that there is no specific or fixed optimum over a period of time. Quantity and quality of resources and the technique of utilizing them are constantly changing in such dynamic economies as characterize modern civilizations. Consequently, in order to determine theoretically what size of population is needed for highest per capital productivity, one must assume a given state of the arts and constant resources of land and raw materials but (theoretically) variable population. The distribution of the product, marketing organization, and monetary system must also be assumed to be such that the output of the productive process at full capacity will be taken off the market for consumption.

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[53] Cf. J. D. Black, "Agricultural Population in Relation to Agricultural Resources," *Annals of the American Academy of Political and Social Science,* November 1936, p. 206. Black indicates that the highest average output per capita of population is affected by the degree of inequality of the distribution of resources between population groups, and by the average standard of living.

[54] A. B. Wolfe, "The Theory of Optimum Population," *Annals of the American Academy of Political and Social Science,* November 1936, p. 244.

[55] *Ibid.*, pp. 245–246.

Wolfe points out other theoretical assumptions which must be made in developing an adequate theory of the optimum population, and acknowledges that as yet the theory shows little promise of emerging from pure conceptualism.[56] However, if the concept of the maximization of product per unit of cost is accepted as the normative end of economy, economic theorists should be able to work out the concept of the optimum or ideal population in definite, limited, understandable (though theoretical) terms.[57] In any case, this theory of the optimum population definitely relates the available units of labor to the land resource, and acknowledges the far-reaching effects of the technological and societal arts upon the utilization practices and productiveness of man working with land.

Determination of the proper economic population of a restricted area is more difficult than its determination for an entire nation, because of the factor of potential migration in and out of the area.[58] Nevertheless, governmental efforts in recent years to adapt population more closely to resources necessitate determination of population needs and capacities of limited areas such, for example, as those to be served by the Missouri or the Columbia Rivers. In any case, the theory of the optimum or ideal man-land ratio, although abstract, is very useful in clearing up some of the misconceptions which exist in regard to the effects of declining population. Such misconceptions are caused chiefly by the widespread tendency to consider the size or quantity of the population alone, rather than its quality, its standard of living, and the distribution of its income or purchasing power.[59]

Methods of Attaining Optimum Population. In modern society, many more ways are available to bring about a closer approach to the optimum population than reliance upon population increase or decrease alone. Every improvement in transportation and communication technique reduces the handicap of space. Improvements in methods of farming and in increased production efficiency enlarge the human carrying capacity of the soil and extend the point at which optimum population is reached. Adjustments in human institutions such as local governmental structures and adjustments in taxes and credit practices to bring about more equitable distribution of tax and credit burdens also extend the point of optimum population in agricultural areas. Improvements in leasing arrangements, irrigation, reclamation and drainage development, inventions—all improvements in the technological and societal arts—tend to extend the point of optimum population.

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[56] *Ibid.*, p. 248.

[57] See Chapter V.

[58] Wolfe, *op. cit.*, p. 248.

[59] Cf. Frank Lorimer, "Population as a Problem in Quality," in *Food for the World*, pp. 58-65.

Certain methods have been used under specific types of conditions during man's history to bring about a better man-land relationship. These have varied from rather minor changes in the organization of farm and business operating units, or in land utilization methods, to sweeping shifts in types of crops raised or in methods of tillage, and when other adjustments seemed inadequate, to land abandonment and migration to other areas where the cycle of land settlement and development was begun again. Man can, of course, take a passive attitude, allowing natural forces to bring about necessary adjustments between population and resources; or he can take the initiative in securing a better man-land ratio through intelligent study and action. The modern age of science assumes that man can play an important part in securing desirable adjustments in the man-land ratio.

Migration. Migration, or movement of people from one area to another, is motivated largely by economic opportunity. People move from areas of low opportunity to areas offering greater economic, social, or cultural advantages. Theoretically, at least, a highly mobile population tends to adjust itself to land resources, by migration, so as to secure the greatest possible economic, social, and cultural advantages, and this adjustment tends to establish equilibrium of population and opportunity. It seems, therefore, that if migration is effective and unmolested, it tends to bring about a better population distribution for each major area. Studies of population movements indicate, however, that establishment and maintenance in equilibrium of population and opportunity is not often achieved by migration. The Northern Great Plains, for instance, experienced a huge influx of settlers just before and during the First World War period who broke up much of the area best suited to grazing, and used it for crop production. Subsequent erosion and drought caused migration from the area during the twenties and thirties, and brought about serious land use maladjustments. The Florida land boom of the twenties and the following deflation period also exemplify the common failure of population movements to bring about more satisfactory man-land relationships.

Although migration tends to establish a better balance between population and economic resources, it often fails to do so. International migration—that is, movements of peoples from one nation to another—has in many cases failed to achieve more satisfactory man-land relationships. Relatively heavily populated nations have adopted colonization programs intended to absorb their excess population. The emigration had little or no effect upon population numbers and growth, because relieving overpopulation by emigration made life easier for those who remained, and the people left at home tended to have more children or fewer babies died because of increased economic opportunities.

It is generally recognized that two consequences of a migration—a lower death rate and a higher birth rate—tend to result in a population increase that offsets the drain of emigration.[60] As a matter of fact, forces set in motion by the departure of a considerable number of inhabitants may actually increase population numbers more rapidly than the decrease caused by departure. In a nation where economic opportunities were increasingly abundant, as in the United States during the early part of the twentieth century, migration from farms to cities was a natural process of voluntary movement in the direction of greater economic opportunity. However, the back-to-the-land movement of the postwar depression of the early twenties and the severe business depression of the early thirties represent a forced movement of people, not in the direction of greater economic opportunities but in the direction of greater economic security on a subsistence level. The Old Testament furnishes many examples of hunger periods in relatively primitive groups, and of migrations which occurred because people were forced to seek areas where a better or more certain livelihood could be secured.

Migration probably tends to increase the world population more rapidly. Departure of people from a country does not ordinarily decrease the population of that nation, and immigrants into the new

[60] Cf. Reuter, *op. cit.*, p. 213.

country increase its population immediately by the number of incomers, and in later years by the number of their offspring. If the area into which the people have migrated is a rich undeveloped area, the increased population numbers may bring about an increase in total wealth and in total per capita income and higher levels of living. The movement of people out of the older area does not, in itself, bring about a permanent solution of the problem of the ideal man-land ratio, since the older area, having fewer people than before, tends to breed back to its former level. Although migration may bring about some minor and perhaps temporary improvements, it should not be considered an entirely satisfactory long run solution of the problem of attaining the ideal man-land ratio.

Emigration from Europe to North and South America and Australia during the nineteenth century played an important part in easing population pressure in Europe and in developing the previously undeveloped countries in the Americas. Since 1929, emigration from Europe has declined until during the worst years of the depression thirties there was actually a net return of migrants to Europe. Severe restrictions have been placed on immigration by many nations during the last years of the nineteenth and the early years of the twentieth century. Quota acts were passed by the United States in 1921 and 1924, and these greatly reduced immigration. Immigration into Canada, Australia, New Zealand, and the Union of South Africa is strictly controlled; and the countries of Central and South America have restricted immigration through the use of visas.[61]

Land Settlement Policies. Throughout man's history, there has been a great amount of population movement in order to gain dominion over the earth's surface. These population movements have been caused by the lure of the spoils of conquest, or to escape from invading groups, or to secure the advantages of greater opportunities offered by new areas. The main route of human migrations has been primarily from east to west, shifting the center of civilization from Asia to the shores of the Mediterranean and Atlantic.[62] Discovery of the continents of North and South America and Australia by Portuguese, Spanish, and English seamen set in motion a great colonization movement. Heavy migrations to the western continents brought about serious problems in the older areas from which the large waves of settlers emigrated, not only because of the large number of people leaving the rural areas but also because of the restlessness and discontent of those who remained, associated with the stratified ownership pattern and peasant status of the people living on the land. The result was that some action was necessary on the part of the older nations to improve the land tenure pattern and increase the opportunities for ownership of the land by the tenant cultivators.

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[61] League of Nations, *World Economic Survey, 1938–39,* p. 165.

[62] Elwood Mead, "Land Settlement," in *Encyclopædia of the Social Sciences,* vol. IX, p. 54.

At the same time, in newly settled areas settlement seemed disappointingly slow and unsatisfactory, so that a system of directed land settlement or internal colonization was evolved. Governmental policies were developed to effect a more planned settlement of the lands in place of chaotic individual settlement. These governmental programs have not been limited to any one nation or group of nations but have been practically universal, although differing considerably in detail in the different nations.

Land settlement policies adopted in such nations as Denmark, Germany, Ireland, Scotland, and other nations to improve land settlement patterns and develop complete internal colonization programs are discussed in some detail in Chapter XIV, "Land Tenure and Tenancy." Denmark, Germany, and Ireland furnish particularly good examples of effective public programs which have brought about a more permanently satisfactory land utilization pattern. The program followed in these nations developed largely because of the great exodus of dissatisfied tenants, laborers, and cultivators to the cities and to other countries.[63] In the United States, the federal government followed a policy of encouraging private ownership and rapid settlement and development of its land area, practically from the beginning. Need of funds to finance the newly established government caused it to offer its public domain lands for sale at relatively low prices per acre. For a time, the financial aspects of land settlement predominated with colonization or settlement aspects secondary. However, before many years had passed, the colonization aspects came to predominate, culminating in the passage of the Homestead Act in 1862, which provided for giving away the vacant public domain lands to settlers.

Rapid settlement of the United States public domain lands under the Homestead Laws resulted in most of the public domain being taken up by private settlers by 1920.[64] After the First World War, the United States passed legislation seriously curtailing immigration; and after the severe drought and depression of the early thirties it embarked upon a program of federal land purchase in certain submarginal areas in order to correct land use difficulties which had developed through private settlement and operation. At the same time, a program of subsistence homesteads (efforts to establish families upon small tracts, on a subsistence basis, with the possibility of getting part-time work in nearby industry) and a program to encourage decentralization of industry, were inaugurated to take care of the thousands of families who could not find satisfactory industrial employment in the cities. Increased appropriations were made for development of irrigation projects to make irrigated farm operating units available for farm and ranch families in the West.

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[63] *Ibid.*, p. 56.

Many nations are now actively engaged in programs to hold their people on the land, and some nations have made efforts to attract settlers from other countries. For example, the government of Brazil at one time offered a given tract of land for Japanese colonization and the Japanese government in turn granted subsidies to migrants to Brazil. Brazil, like so many other nations in recent years, however, has adopted a quota system which limits immigration. Similar agreements were entered into between Great Britain and the dominion governments of Canada and Australia, providing for aid in placing English colonists on the land in the Empire's overseas possessions.[65] Since the beginning of the twentieth century, colonization of great areas in Manchuria and Inner Mongolia has been carried out by millions of Northern Chinese; and Southern Chinese have played an important part in the development of Malaysia and the Netherlands Indies.[66] Considerable migration into Canada has occurred, largely from Northern Europe. The Japanese have been active in colonizing Hokkaido, Korea, the Pacific Mandate, Manchuria, Hawaii, South America (particularly Brazil), and the

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[64] The 1862 act granted a homestead of 160 acres, and the 1909 act granted 320 acres of non-irrigable land in certain states. The 1916 stock-raising homestead act provided for a maximum homestead of 640 acres of land suitable only for grazing or forage.

[65] Isaiah Bowman (ed.), *Limits of Land Settlement*, pp. 62 and 333.

[66] Owen Lattimore, "The Mainsprings of Asiatic Migration," in Isaiah Bowman (ed.), *Limits of Land Settlement*, chap. V.

Philippines. Emigration from Great Britain into Australia after World War I was rapid.[67]

European settlement is in all stages of development in various parts of Africa, having been in progress for more than a century in Algeria, and for half a century in Tunisia, while in Morocco the process is in its first stages.[68] Climatic and biological factors, particularly tropical diseases, are important influences which have hitherto kept Europeans from colonizing Africa more rapidly. Future settlement of this continent by Europeans will depend to a large extent on the success with which these checks can be overcome. The efforts of Italians during the thirties to colonize Ethiopia and push southward into other parts of Africa may be the beginning of a more active settlement and colonization of this continent. The victory of the United Nations over the Axis powers in World War II will change the settlement policies and patterns in North Africa considerably from those of the immediate prewar period. Settlement in South America in recent years has not been excessively large, although appreciable numbers of Europeans have migrated to certain parts of this continent, and there has also been some settlement by North Americans, particularly those from the United States.

Another important development after the First World War was the Jewish land settlement in Palestine. Mexico, since the Revolution, has gone further than any other modern nation toward directed settlement of the land, on the basis of small holdings; but no quarter of the globe has been left untouched by the recent movements to colonize undeveloped areas to work out more satisfactory land tenure patterns in the older settled areas.

After the First World War, special efforts were made in many nations to assist ex-service men to obtain farm homes. All the English-speaking countries passed special soldier settlement legislation. Although the federal government of the United States did not adopt such soldier settlement legislation, several states during the war period and immediately thereafter set up land settlement boards and adopted various policies to get settlers on the land. These states were California, Washington, Oregon, South Dakota, North Carolina, South Carolina, and Colorado. Many states passed legislation promoting, directing, or regulating one or more phases of land settlement; but many of these state programs failed to accomplish the desired results because of inherent weaknesses and ill-advised zeal in promoting unwise settlement.[69]

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[67] Griffith Taylor, "Possibilities of Settlement in Australia," in Isaiah Bowman (ed.), *Limits of Land Settlement*, chap. IX, p. 242.

[68] J. H. Wellington, "Possibilities of Settlement in Africa," in *ibid.*, chap. IX, p. 224.

Many mistakes have been made in land settlement policies at various times, because of the desire to push settlement too rapidly or to achieve selfish pecuniary ends on the part of certain commercial interests, without considering the welfare of settlers. Out of these experiences have come definite lessons regarding desirable types of policies and conditions which must be established to secure satisfactory directed land settlement.

Population Policies. Various policies have been adopted by man to influence population numbers. In earlier societies, infanticide; killing the old, sick, or useless members of society, or hastening their death by poverty and neglect; abortion; sex taboos; passive acceptance of recurring epidemics, famines, and similar catastrophes; war; emigration; and contraceptive practices have all been used to a greater or less degree to reduce population numbers or retard population increase. On the other hand, many societies have inaugurated policies to stimulate increase of their numbers. Princes and political and military leaders have desired large and growing populations for better protection against predatory neighboring rulers, or to make possible expansion of their own rule over larger territories. Closely associated with this political stimulation of population increase is the economic motive of having large and growing populations to provide cheap labor for production.

Practically all population policies practiced by social groups have been designed to retard or to stimulate increase, with no attention paid, in most cases, to the improvement or injury of the quality of the stock through such policies. In recent years, a number of countries have adopted specific policies to meet population problems that have developed because of the downward trend in birth rates. Practically all of these modern policies are designed to encourage births. In France, family allowances have for a long time been paid to workers according to the number of their children; and in Belgium, Chile, Italy, Russia, the Scandinavian countries, and New Zealand schemes of family allowances or other measures to encourage births have been inaugurated. Nazi Germany during the thirties adopted a comprehensive policy for the promotion of births and for a time it seemed to accomplish a considerable net increase in the birth rate.[70] The Nazi population policy inaugurated in 1933 included: favors to the large family, such as income tax allowances and inheritance tax favors; rent allowances; preferences in public and private employment; safeguards against discharge from employment; a vigorous campaign against abortion; and provision of a marriage loan, a fourth of which is remitted on the birth of each child. During the early years of World War II, married soldiers were given suitably spaced furloughs in order to prevent a decline in the birth rate, but the subsequent exigencies of war destroyed any illusions Nazi authorities may have had regarding maintenance of the birth rate at a high level.[71]

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[69] W. A. Hartman, "State Land Settlement Problems and Policies in the United States," U. S. Department of Agriculture, Technical Bulletin 357, May 1933.

The net effect of modern efforts to increase fertility in various nations has, for the most part, been rather insignificant.[72] The birth rate in France has continued to decline, while in Italy it seems to have remained about the same, and has increased but slightly in the Scandinavian countries. Apparently the economic inducements to increase birth rates have not been sufficiently large in the population policies followed by these nations. Cultural factors are greater modifying forces; at least they are sufficiently strong so that they have not been overcome to the point of achieving any significant increase in births.

Prospects for Population Redistribution. The parts of the world considered most likely for future settlement and emigration include parts of Canada, Africa, Australia, South America, Siberia, and certain islands in the South Pacific. Most of the remaining pioneer lands are considered "marginal" in climate, fertility, and transport.[73] Although there are many political, physical, and economic difficulties to be overcome in settling these areas, modern science has vastly widened the earth's area that is satisfactory for human habitation and growth. Facts show that a much greater growth of population has occurred in the four centuries of modern history than in all the thousands of years before. In terms of production, all the major physical resources of the world have been brought into use "resource by resource, and area by area, at first slowly, then with a rush."[74] Sauer argues that in modern history cultural resources have been diffused, in contrast with prior history whose cultures were in large measure self-contained, so that it is difficult to find areas that have not received the cultural goods of other parts of the world. A blocking out of the world as to productive capacity, and hence as to population, has been realized as never before. "Perhaps we can even say that, by and large, the people of the world today are where they belong under their present standards of living and cultural organizations. . . . Marked shifts in relative density will become more exceptional and more restricted as to areas involved."[75]

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[70] The German birth rate increased from 14.7 in 1933 to 20 in 1940.

[71] From a figure of 20 per 1000 in 1940 the rate slumped to 14.9 in 1942. Louis I. Dublin, "War and the Birth Rate," p. 2.

[72] The increase in the German birth rate from 14.7 in 1933 to 18.0 in 1934, and a further increase to 19.7 in 1938 and to 20 in 1940 is the only example of any significant increase accompanying modern population policies effected by any nation. This increase was very temporary and with the progress of the war, the Nazi birth rate declined rapidly.

[73] Isaiah Bowman (ed.), *Limits of Land Settlement*, p. 2.

The point of view which Sauer advances implies that the population of the world has become permanently inactive; that there will not be any extensive waves of emigration and colonization among the continents; and that the internal shifts in population which will occur will be relatively minor in scope. Hence, the prospect for population redistribution in the future is one in which the man-land adjustments to be made will be primarily by people already inhabiting a given area. Sauer is not unappreciative of the motivating effects of technological advancement, improved production techniques, scientific advance, changes in market demand, improved transportation, and similar possible developments upon human carrying capacity of various parts of the world. However, he argues that technological advance will probably develop relatively more benefits within the present areas of advanced technology than in outlying parts of the world.[76] Even though oil or other valuable minerals may be discovered in sparsely settled deserts or tropical forests, such discoveries are often not enough to offer extensive outlets for population from other areas. Moreover, with modern technology, a smaller and smaller number of workers is required to mine, refine, and transport the fossil fuels which are the major energy sources in modern economies. Thus, it would seem that mining booms or discoveries of new oil fields will not play a major role in future population shifts.

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[74] Carl O. Sauer, "The Prospect for the Redistribution of Population," *Limits of Land Settlement*, chap. I, p. 9.

[75] *Loc. cit.*

[76] Sauer argues that in the case of the tropics, for example, the native population has higher reproductive rates than the white colonists, and with the introduction of white settlement the major benefits of sanitation would apply to the native population, with the result that there would be a tendency for its growth to outstrip the growth of white population and to exert pressure against the white colonist, as time went on. (*Ibid.*, p. 223.)

All of this does not mean that there will not be important international rivalries and conquests of less aggressive, more backward cultures by the more advanced, aggressive ones; or attempts by various nations to gain control of important natural resources for exploitation. However, it does mean that these conquests and controls which may be established will probably involve political and economic changes, rather than wholesale migration of populations. There will, of course, be important changes in population density within nations and within continents to bring about a better man-land ratio; but relative population densities among the continents may not change greatly from those of the present.

These conclusions may seem inconsistent with certain estimates that have been made from time to time of the potential human carrying capacity of some of the continents settled sparsely at present, such as Africa. Estimates of the potential human carrying capacity of this continent vary from about a billion to two billions, the present population being only 154 millions. However, it is still possible that this continent may ultimately have a population of a billion or more, and yet not experience any great waves of immigration or colonization from outside areas such as Europe. It is conceivable that this greater population density could be achieved through development of effective methods of controlling tropical diseases and related climatic and economic forces by increases in the native population or neighboring areas, rather than by an influx of Europeans, except in relatively small numbers in key positions of leadership and control. It is more logical to expect that advantages which will accrue from the increased productiveness of such pioneer areas may be secured for those who are in a position to exploit these possibilities from their present homes, rather than move to these pioneer areas to secure such benefits. Great Britain is a good example of a modern nation drawing upon external carrying capacity because of her political, commercial, and financial position, and being able to support a population estimated to be much greater than that of her physical internal carrying capacity.

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CHAPTER FOUR

LAND APPROPRIATION

MEN share land for use and profit according to the prevailing culture. Some cultures permit completely free and uncontrolled use of land by all who express a desire for it, and others strictly regulate all actions which affect land.

SOCIAL STRUCTURES AND PROCESSES OF LAND APPROPRIATION

Groups have survived only when they have defined expected individual behavior rather specifically, achieving order in their societies through communication, imitation, suggestion, and other processes of social interaction. The ecological processes which establish through competition the relation of man to his habitat help to shape the structure of society. These two types of processes are of great importance in determining the relation of man and his culture to land.

Human Ecology. How men and their cultures assume characteristic patterns of distribution in space and time is the field of human ecology.[1] Because of relative scarcity, the selective distribution of men and their cultures on land is highly competitive. An impersonal competition for existence occurs among human beings just as it does among plants and animals. Competition also occurs between man and other forms of life in his environment, but it is most ruthless between man and man. The ecological distribution of men is distinguished from that of animals by the development of a social structure. This structure can be built only by human beings, because no other form of life has access through language to a social heritage. Man's relation to his environment is therefore characterized by both a biological and a social motivation. The first operates through ecology; the second, through processes of social interaction. The ecological processes through which competition operates are dynamic forces of change causing continual adjustment of population numbers and forms, and adaptation of the institutional structure. A knowledge of these processes is very useful in explaining the migrations of people and their distribution on the land.

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[1] See especially R. D. McKenzie, 'The Scope of Human Ecology," *Publications,* American Sociological Society, vol. XX, pp. 141–154.

Sociologists suggest five major processes of human ecology: *concentration, centralization, segregation, invasion,* and *succession. Concentration* is the process by which certain areas become densely populated. This may occur where natural sources of food supply are readily won through a minimum of effort. Huge concentrations of people have occurred in India, where the soil provides year-round food for large concentrations of people. On the other hand, there are many regions of active concentration such as the maritime coasts in northern countries where the climate and soil are less bountiful. Here the rigors of climate and the frugality of nature originally required much ingenuity on the part of those people who were to survive. Passive enjoyment of the resources was not sufficient for such folk: they developed an intricate system of transportation, food storage, and distribution which eventually freed large numbers of the group for other pursuits. Urban communities of England, such as London or Birmingham, to which food is shipped from all corners of the world, illustrate active concentration. Areas of active concentration can use land in highly specialized ways, increasing the total productivity immensely.

Development of focal points dominating the hinterland is called *centralization.* The focal points are the most active and sensitive spots where basic institutional services are located. They are the centers of transportation and communication to which other points look for leadership and direction. In the capitalistic world, the metropolitan cities of New York and London have long been the centers of dominance. Trade and the financial and cultural movements of subservient areas are channeled through these cities. Every community exhibits the process of centralization—sometimes by the growth of cities, towns, or villages at a crossroads, and sometimes by a nodal string of towns along a railroad, like those so common in sparsely settled prairie or plains areas. The same process occurs in metropolitan areas where financial and downtown areas become centers of activity, and subcenters establish themselves in little knots through the city's periphery. The central sections are characterized by the highest land values, the greatest mobility of people, the most rigorous competition, and the most rapidly changing institutional patterns.

The clustering of like units is the process of *segregation*. Homogeneity in ideals, customs, and institutions promotes similar uses of land within these units. This is impressively illustrated by the segregation of ethnic groups into homogeneous communities such as the Black Belt of Negroes, "Little Italy" in Chicago, or the Mennonite communities of North Dakota and western Canada. Segregation occurs in areas of occupational specialization around specific resources, like the mining sections of the intermountain United States, or New England's small scale manufacturing communities with miniature water power facilities.

When people are on the move, or new resources, methods, or products are discovered, the process of *invasion* occurs. Communities and institutions are living, growing things, subject to new movements at all times. A dramatic illustration of invasion is the phenomenon of the gold rush, where people from all walks of life move rapidly into the gold fields. The same general pattern is exemplified by the development of new resources in the Columbia River Basin of the State of Washington, where the building of the Grand Coulee Dam attracts settlers and permits the establishment of intensely farmed irrigation units.

The process by which the original land use is displaced by a new one is that of *succession*. It is the equilibrium occurring after invasion, which establishes the pattern of distribution of men and their culture on land. In a gold rush, for instance, the entering people displace old structures and land uses with new ones, in the process of finding temporary shelter, setting up mining machinery, hotels, gambling houses, and new communication and transportation systems. Several stages of displacement and succession can be discerned in the Columbia River development. A temporary city grew up overnight to house workers at the dam site. When the dam construction was completed, the intensely active mobile population catering to the needs of engineers and laborers disappeared, and the needs of an irrigation agriculture were supplied by fewer people and a more stable set of institutions. The outlying agricultural population, the transportation network, and the whole landscape were changed in type and distribution. Such a process of succession realigns the social structure and especially affects the institution of property in ways of great interest to the land economist.

These ecological processes, the result of human competition for the appropriation and use of land resources, help to explain the past changes in the temporal and spatial relations of men and to indicate changes likely to occur in the future. Through the interaction of these dynamic elements, man and his institutions are continually driving toward an equilibrium. The processes of human ecology explain the migration, density, and distribution of men and give direction to many human aims and ideas.

Social Interaction. The ecological framework is given life and consciousness by the processes of social interaction in which the common practices and experiences of men give rise to the loyalties, the hates, the conflict of ideas which are characteristic of society. Ecological action, largely unconscious and impersonal, distributes men and their institutions, but social interaction is responsible for group adaptation, invention, and "progress." Social interaction builds a society out of folkways, customs, mores, and institutions, through the penetration of mind by mind and the interchange of group attitudes.

Institutions (one of the most primary of which is property) may be defined as well-established social structures within which men do collectively the things which seem right and proper, in regard to some fundamental interest of life. Institutions can be distinguished from other forms of long-established practices by the following four characteristics: (1) a common set of attitudes held by all persons in the group, which are directed toward gaining satisfaction for basic needs; (2) *symbols* which arouse interest and by which people can be made to do things as a group which they would not do as individuals; (3) *physical objects* which tend to give it reality; and (4) *rigidity, permanence,* and *form,* which are attained by written or oral documents, laws and creeds.[2] A social structure is a set of behavior patterns, accepted within a society, which individuals in that society learn to use. Legal codes, the leader-follower relationship, respect for the rights of others, are examples of such patterns. No one structure determines the entire behavior of any individual. For each fundamental interest he has, the individual's action is guided by a different institutional mechanism. It would be highly improbable that a group of students would begin a dance in the middle of an afternoon class in land economics, but quite probable that they might prepare after class to attend a dance in their student union building; for each institution developed around education and around recreation has a unique code of behavior recognized and conformed to by the individual.

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[2] Cf. F. Stuart Chapin, *Contemporary American Institutions*, Harper, New York, 1935, p. 15. According to Cooley, "the intimate and distinctive character of an institution might be compared to the theme of a symphony, continually recurring and of which the whole organism of the music is a various unfolding. Like that, it is a pattern through the web which this particular loom turns out." (See his "Case Study of Small Institutions as a Method of Research," *Proceedings of the American Sociological Society,* xxii, 1938, p. 130.) For various definitions and explanations, see particularly E. C. Hughes, *The Growth of an Institution: The Chicago Real Estate Board*, The Society for Social Research of the University of Chicago, Series II, monograph no. 1, 1931.

Institutions tend to be relatively permanent; they draw upon particular individuals but are not dependent on them. The particular individual is the "carrier" of the institution, for his own mind retains institutional behavior patterns, either consciously or unconsciously; but the pattern is so omnipresent in the group that particular persons are unnecessary to the continuance of the institution. Persons cannot belong to an institution, but they can belong to a group or an association, the objective counterparts of institutions, like the church or the family.

Knowledge of the development of institutions is essential to an understanding of their functions. Living in groups forced men to develop rules of behavior. Early in the history of society, sheer force gave place to folkways, or behavior that was "proper." Certain folkways eventually became essential to the welfare of society and grew more rigid. For instance, prehistoric hunters had to hide or guard their meat. Groups which formed the habit of respecting individual rights to the hunt or the harvest survived. These rights later become sanctified into mores; and those who failed to respect the mores were eliminated from the group. Finally these mores evolved into the institution of property, under which each member of the group well knew how he should act with respect to the tools of other men and the fruits of other men's labor.[3]

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[3] " . . . institutions . . . take shape in the mores, growing by the instinctive efforts by which the mores are produced. Then the efforts, through long use, become definite and specific. Property, marriage, and religion are the most primary institutions. They began in folkways. They became customs. They developed into mores by the addition of some philosophy of welfare, however crude. Then they were made more definite and specific as regards the rules, the prescribed acts, and the apparatus to be employed. This produced a struc-

In "high civilizations," institutions may seem to have been rationally invented or intended. They may be partly enacted by common consent or the power of government. Many characteristics of modern property are a part of the social heritage, but many others are the result of current effort to force certain desired habits upon the social group through legislation or rules of procedure. The recognition of this fact is essential, if we are to achieve a social system which can adapt itself to the most desirable aims of society.

Property as an Institution. Property is the most important institution conditioning land utilization. Land cannot be a limiting or strategic factor where there is a superabundance of it, and property in land would exist only where there is an economic scarcity of land. Property therefore is the one all-inclusive institution conditioning the economic processes of land utilization. It determines the rights and duties of the individual in utilizing a given parcel of land or in dealing with others who may utilize land. Property, marriage, and religion are considered the primary institutions, but emphasis is placed on property in this chapter, for the reasons given, although it is true that other institutions help to shape the institution of property itself and to make up the cultural environment within which man operates. Even though property is influenced by this institutional and cultural environment, the situations and relationships with which land economics is concerned are those which arise directly or indirectly out of the relationships of rights and duties occurring within the institution of property, as it exists in the cultural environment. Moreover, most social improvement projects involve the substitution of some more consciously social form of control over private property and individual freedom of contract. Thus, the possibility of improving human living through changes in the organization of want-satisfying activity in the utilization of land resources centers around changes in the property institution.

Lands of certain desired production or location qualities are scarce enough so that protected rights and duties must be established in connection with their use if order is to exist. The concept of *property* which gives persons or groups a protected right in land, thus "personalizing" it, has been found essential under conditions of scarcity where human labor is incorporated into land to produce

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ture and the institution was complete." William Graham Sumner, *Folkways: A Study of the Sociological Importance of Usages, Manners, Customs, Mores, and Morals*, Ginn, 1906, chap. I.

economic goods and services. Property rights in land are the basis of other rights—the right to lease, the right to use, or the right to sell—and in this sense condition land use and the value, price, income, cost, and related economic and social considerations involved.

The word "proprietas" is derived from the Latin noun *proprietas* ("in accordance with custom"), but property has passed beyond the stage of mere custom. Like other institutions, it has been modified from time to time, when necessary in order to meet successive crises. Institutions which do not or cannot change with changing times are said to be coated too thickly with the "cake of custom"—that is, to have lost their capacity to act or to be useful in the world of reality. Property today, therefore, especially as it applies to land, implies certain things and implies action patterns which property in ancient times did not.

Because of the predominance of property as an institutional force conditioning land utilization, it is essential that the student of land economics understand the characteristics and attributes of property, and the stages through which landed property has evolved to its present status. The nature and scope of the problems in land utilization with which land economics is concerned arise out of the property institution, because it determines not only what men will do in utilizing land but how and when they will utilize it.

Characteristics and Attributes of Property. The property institution regulates relationships of men to material things, distinguishing the belongings of one man from those of another. A man may utilize or dispose of his property, or of the products of his property, under the *right of contract* (the means by which a property owner enters into transactions with others, pledging to do or abstain from doing certain things in accordance with laws and regulations); or his property rights may pass to the next generation by *inheritance. Value* is a universal attribute of property, for economic goods or services (which must possess utility and scarcity) are valuable, and exclusive property rights in such goods have value to the owner. Such rights may be sold or leased "for value received," or they may be used and controlled to secure to the owner a flow of income or benefits; and these rights may be restricted by the governing power, or may be very broad. The concept of property varies as widely as the societies where it is found; that is, its meanings depend upon its use and the current cultural development of the people who use it.

During medieval times, "property" came to mean "a feudal privilege or relationship." This emphasized the essential nature of property as a reflection of the dealings of men arising from their relations to things.[4] Property does not exist until human control is established over things, and only a thing which has three essential characteristics can be made property. (1) It must be capable of satisfying a human want, in which case it is called a good or service; (2) it must be capable of appropriation; and (3) it must be so limited in supply that some human wants must go unsatisfied—that is, there must be a scarcity of the good or service, otherwise it would be a free good. Property rights are established only in economic goods or services, since there would be no reason to appropriate a valueless thing.

A good definition of property is the right to control (use, lease, and dispose of) an economic good or service subject to the limitations established by laws and regulations.[5] There are three components of this concept of property—the *owner*, who exercises control over the good or service, subject to limitations established by laws and regulations; the *object of property*, which is the thing controlled; and the *soverign state*, community, group, or other social organism protecting the owner in his rights over the property object. Property is, then, *a conditional control existing at the pleasure of the governing group*, which may be the state or, in less formally organized societies, the family, community, or tribe.

If rights to control or use an economic good or service were absolute or exclusive, they would prevent any limitations or qualifications upon such control or use. There is a social aspect of property rights which implies a certain social control and an evolutionary flexibility in the property concept for the purpose of meeting changing needs. Each group develops its unique and changing ways of using natural resources, of organizing production, of appropriating wealth, and of carrying on the other activities which satisfy its needs; and property as an institution exists because it fulfills one of the primary human needs—the desire for security.[6] The owner's equity in a property object, however, remains definitely conditional. It is conditioned by current conventions, attitudes, and group habits, changing with cultural, technological, and biological variations in the society, whether such changes occur in a few years or over a long period of time.[7]

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[4] R. T. Ely, *Property and Contract in Their Relations to the Distribution of Wealth*, Macmillan, 1914, vol. I, p. 96.

[5] Property has been defined as "a conditional equity in the valuables of the community" (*Encyclopædia of the Social Sciences*, vol. XII, p. 529.) Definitions given by Blackstone and Ely emphasize the feature of exclusive dominion. For example, Blackstone once called property "that sole and despotic dominion which one man claims and exercises over external things of the world, in total exclusion of the right of any other individual in the universe." (Blackstone's *Commentaries on the Laws of England*, book II, chap. 1.) Ely defines property as the exclusive right to control an economic good (see his *Property and Contract*, p. 101.) However, these definitions must be modified because neither property rights (see *Munn* vs. *Illinois*, 94 U. S. 113, 124, 125) nor contract rights (see *Allgeyer* vs. *Louisiana*, 165 U. S. 578, 591) are absolute or exclusive. "Government cannot exist if the citizen may at will use his property to the detriment of his fellows or exercise his freedom of contract to work them harm. Equally fundamental with the private right is that of the public to regulate it in the common interest." (*Nebbia* vs. *New York*, 291 U. S. 502.)

The Fifth Amendment, in the field of federal activity, and the Fourteenth, in connection with state action, condition the exercise of the admitted power to regulate private property by providing that the end shall be accomplished by methods consistent with due process. The guaranty of due process is that laws shall not be unreasonable, arbitrary, or capricious, and that the means selected shall bear a real and substantial relation to the object sought to be attained. Regulations valid for one sort of business or in any given circumstances may be invalid for other sorts or for the same business under other circumstances. The reasonableness of each regulation depends upon the relevant facts.[8] Although the Fourteenth

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[6] Sociologists have grouped the major human wants into four kinds: (1) desire for new experiences, (2) desire for security, (3) desire for recognition by one's fellow men, and (4) desire to achieve a response from others in order to develop one's personality and ego. A society's way of satisfying these major needs fixes the conditions under which wealth (material objects which have economic utility) may be appropriated. R. E. Park, and E. W. Burgess, *Introduction to the Science of Sociology,* 2nd ed., University of Chicago Press, 1924, pp. 489–490.

[7] "The power to promote the general welfare is inherent in government, and according to the Constitution, the United States possesses the power, as do the states in their sovereign capacity, touching on all subjects jurisdiction of which is not surrendered to the Federal Government. These correlative rights, that of the citizen to exercise exclusive dominance over property and freely to contract about his affairs, and that of the state to regulate the use of property and the conduct of business, are always in collision. No exercise of the private right can be imagined which will not in some respect, however slight, affect the public; no exercise of the legislative prerogative to regulate the conduct of the citizen which will not to some extent abridge his liberty or affect his property. But, subject only to constitutional restraint, the private right must yield to the public need." (*Nebbia* vs. *New York,* 291 U. S. 502.)

[8] *Ibid.*

Amendment extends protection to aliens as well as to citizens,[9] a state may for adequate reasons of policy exclude aliens altogether from the use and occupancy of land.[10] There is no closed class or category of businesses affected with the public interest. The phrase "affected with the public interest" merely means that for adequate reason the business or property is subject to control for the public good. There can be no doubt but that on proper occasion and by appropriate measures the state may regulate a business in any of its aspects. The legislature is primarily the judge of the necessity of a given law or regulation, and the courts merely decide whether the laws passed have a reasonable relation to a proper legislative purpose and are neither arbitrary nor discriminatory. Under these conditions, the requirements of due process are satisfied provided there are no constitutional restrictions. Thus, a state is free to adopt whatever economic policy may be reasonably deemed to promote public welfare and to enforce that policy by legislation adapted to its purpose.[11]

The peculiar importance of property rights lies in the fact that they are the basis of other important rights. However, none of these rights can be final, irrevocable, and "inalienable," especially in a modern highly commercialized machine civilization. Through social control, property rights must be modified from time to time, so that property may improve the general welfare rather than enrich too greatly the fortunate or aggressive few.

The limitation of property rights by society affects both their *quantity* and *quality*. What goods can be owned privately, and which are reserved for public ownership? What may an individual do with his property? What a man may do with the property which he is permitted to own is as important as the type of property he may own. Society has usually not desired to abrogate the right of private property in order to reduce the waste and dangers of uncontrolled private property in land, but has preferred to exert necessary control through modifying property priviliges. Though in some cases abrogation of private property rights in certain goods has been necessary, in others more restrictions upon utilization, lease, and sale practices have been sufficient, for the time being, to achieve the desired ends.

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[9] *Yick Wo* vs. *Hopkins*, 118 U. S. 356, 369.

[10] *Terrace* vs. *Thompson*, 263 U. S. 197; *Webb* vs. *O'Brien*, 263 U. S. 313.

[11] "With the wisdom of the policy adopted, with the adequacy or practicability of the law adopted to forward it, the courts are both incompetent and unauthorized to deal. . . . Times without number we have said that the legislature is primarily the judge of the necessity of such an enactment, that every possible presumption is in favor of its validity, and that though the court may hold views inconsistent with the wisdom of the law, it may not be annulled unless palpably in excess of legislative power." (*Nebbia* vs. *New York*, 291 U. S. 502.)

Types of Property. Property may be divided into classes of owners (property subjects) or of property objects. By subject, property may be classed as *private, public, group,* and *qualified.* By object, it is divided into *realty* (real estate) and *personalty* (personal property), by law, on the basis of relative mobility. Since land is the most immobile property object, landed properties are called "real estate," and most things attached to the land—buildings of a permanent and fixed character, trees, minerals, etc.—are also classed as realty.[12]

Private property is found when the right to an economic good or service is vested in a private person, either "natural" or "artificial." A corporation is legally an "artificial person," with the same property rights as a "natural person" or ordinary private individual.[13] The property of quasi-public corporations like privately owned railroads and utility companies should not be confused with public property, since it is only private property subjected to strict government regulation because of the peculiar position of such enterprises in relation to the public welfare.

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[12] Property objects may also be classified as (1) rights of control over corporeal things (tangible, material commodities), (2) rights of control over personal services, and (3) property in relation to persons and things—what might be termed intellectual property, such as patents, trademarks, copyrights, and goodwill—(Ely, *op. cit.*, p. 274). Commons classifies property objects into (1) corporeal (tangible), (2) incorporeal (credits, including proprietary stocks or equity shares in modern corporations), and (3) intangible ("the present value of future bargaining power of capitalists"—that is, goodwill and associated property values). H. M. Groves, "Commons' Theory of Reasonable Value as Applied to Taxation," in *Property Taxes,* Tax Policy League, 1940, p. 175.

[13] In recent years, the development of corporate business in the United States has caused an increase in the amount of property owned or controlled by corporations. Partnership property is intermediate between strictly individual property and corporate or collective property, and this step has been omitted in the United States in most instances. The economic complement of the mass production factory or machine is the corporation which, through the issuance of stock shares or equities, accumulates under one management the large amounts of capital needed to finance such large-scale, comercialized production; and technological processes have developed too rapidly, under modern finance capitalism, to allow as much use of partnership property as might be logically expected in a more gradual evolution of business organization and production toward corporate enterprise.

Public property exists where the right to control an economic good or service is vested in formally organized governmental units (which are classed as legal or artificial persons) such as school district, township, city, county, state, or federal governments. The rights of federal and state governments to own property are established in the Federal Constitution. Political subdivisions of the states, however, such as counties, cities and towns, school districts, and townships, may also own property under authority granted them by state governments representing the people of the state. A wide range of variation exists among the states in degree of control granted to political subdivisions.

Group property occurs when the exclusive right to control an economic good or service is vested in an association of individuals or in a community, tribe, or family bound together by some common loyalty or interest. Such associations or communities or groups must be distinguished from and are usually smaller than a formally organized governmental unit, as we understand government.

Common property is a well-known form of group property. In the case of common property, individuals can use the property "in common," or to the exclusion of others who are not members of the group or do not meet qualifications established by the group who have "rights in common" to the property. Modern public property differs from common property in that no individual has exclusive rights to use or control such property except as authorized or granted by governmental officials elected, as representatives of the people, to operate the government. The common pastures of early New England, best known of which is the Boston Common, were examples of common property. Ordinarily, those owning land and cattle in the surrounding township area had the right to use the common; those who did not own such surrounding lands could not graze cattle with their neighbors on the plot designated as the common.

Common property, in the strict sense of the word, does not exist in the United States today, because of the widespread tendency to establish ownership in some natural person or to develop an artificial legal entity such as the modern corporation. The old New

England commons cannot today be classed as common property, since they are owned by the town and are therefore public property. Where a formally organized unit of government exists, property rights common to the members or residents of that political unit must now be classified as public property, not common property.

Grounds and buildings of a private corporation such as a golf club, which are used in common by the members of such clubs, cannot properly be classed as common property, since the club itself is legally merely a private corporation or "artificial person." This form of private property may be referred to as *property in severalty*.

The term *joint property* has been used by various writers to distinguish a form of collective ownership by partners, families, clubs, religious fraternities, or sibs.[14] In those cases where the land holding group and the economic group coincide, there is no distinction between joint property and common property, but where they do not coincide, the difference in territory and membership involved distinguishes them. Basically, however, they are similar types of property under the general heading of group property.

The term *qualified property* is sometimes used to denote "a temporary or special interest liable to be totally divested on the happening of some particular event"[15] in contrast with full property, which denotes a "full and complete" title and dominion over the property object. This term has been found useful because of the special difficulties pertaining to private appropriation of certain kinds of property objects. Fish and game are frequently classed as qualified property on the grounds that, while they are generally considered the property of the state, they are really controlled by the state "in trust for the public," not owned by the state. This question of ownership is primarily an academic one, and of little practical significance; and to define "qualified property" as that which is somewhere between free goods (in which individuals have no legal rights at all) and full property (in which individuals have many rights) does not clarify the question. All private property rights are conditional and not absolute, since society may at any time abolish certain privileges of private property and may even remove property objects from the domain of private property. Literally, then, all property is "qualified."

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[14] R. H. Lowie, *Primitive Societies*, Liveright, 1920, p. 206.

[15] Kent's *Commentaries on American Law*, vol. II, 14th ed., p. 348.

In a modern economic society with formally organized governmental units, only private property and public property have much economic significance, though at various stages of civilization the terms "common," "joint," and "qualified" property have been very useful. There are all grades and qualities of private property and various degrees of public regulation short of outright public ownership. Even in the case of publicly owned property, great variation occurs in the use which private individuals may make of such property.

Property and Other Institutions. In a great many ways, the appropriation of land through property rights is significantly influenced by such other institutions as the family and the church. Agricultural land appropriation is especially influenced by family relationships, though urban or forest land appropriation is dominated much less by these factors. Family loyalties are often identified very closely with farms; and the resulting inertia to migration materially affects land use, size of operating units, and sensitivity to price response. Where family bonds are strong, and where custom demands that certain members of the family shall inherit the property rights of the father, the small units which result from splitting farms among successive heirs give rise to serious problems. Programs of directed resettlement have often been seriously impeded by the unwillingness of families to seek new economic opportunities when the original farm has become submarginal.

Religious codes are responsible for the growth of many unique uses of land. Even in the modern cultures, where religion has been least influential in land appropriation, may be found block-settled communities of Shakers, Doukhobors, Mennonites, or Mormons. Each of these groups has a special pattern of land use. The last three are characterized by a village type of agriculture entirely unlike that in adjacent and similar areas.

Closely related to the institutions of the family and religion is the institution of education, whose primary function is the transference of aims, ideals, and common practices from one generation to the next. Education is therefore an important means of maintaining the continuity of society and keeping the rights of property in land within fairly predictable bounds from period to period. In contrast to its continuity function, modern education provides a medium of social interaction in which invention and innovation are developed and problems are met and solved. Education is an ideational crossroads, from which civilization advances to meet its new problems.

EVOLUTION OF PROPERTY RIGHTS IN LAND

Property, as we have noted, is the most important institutional influence upon land utilization through its effect on distribution of income or returns from land. Obviously, property in land did not arise until methods of utilizing land were such that incorporation of human labor was involved, or until there was a scarcity of lands of certain location or production qualities. When this stage was reached, the forms taken by property in land varied with the culture and the stage of social development of the people involved. Moreover, the nature of property rights in land has varied considerably during their evolution among different peoples, and the privileges which property in land now conveys to the owner are quite different in various parts of the world.

Because of the basic place which property holds in land economics, the student should be familiar with the explanations which have been made of the origins of private property in general; with the stages in the evolution of landed property, from primitive to modern times; and with the present status and trend of private property rights in land, compared with those of property in capital goods. This historical treatment gives the student a more comprehensive understanding of the important characteristics of the property institution, of the problems arising because of the utilization of land resources within such an institution, and of approaches which might be used in solving such problems.

Theories of the Origin of Private Property. Much has been written to justify private property on philosophical or natural grounds, and many theories have been propounded to explain how private property originated.[16] In appraising these theories, it should be pointed out that private property is a man-made device, related to group survival and demanded by expediency. Since property is a conditional grant by the state or the sovereign unit, giving the owner certain protected although not absolute rights, private property must serve some desirable ends or the state would withdraw its assent and abolish it. Consequently, any adequate explanation of the origin of private property must justify it on social grounds. The general welfare theory is now generally considered the correct theory of the origin of private property.[17]

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[16] Ely lists and discusses in some detail nine theories, in the following order: (1) the natural rights theory, (2) the social contract or social compact theory, (3) the human nature theory, (4) the occupancy theory, (5) the labor theory, (6) the theistic concept of property, (7) the robbery and violence theory, (8) the legal theory, and (9) the general welfare theory. See Ely, *op. cit.*, vol. II, chap. XXII.

Landed Property in Primitive Societies. It is generally conceded that private property developed first in certain personal possessions, and later in certain types of land, often burying grounds, wells, and springs. Burying grounds often had special religious importance to primitive peoples, and wells and springs in arid areas were strategic and relatively scarce.

Intensive specialization or cultivation of the lands seldom developed in the earliest stages of civilization. Hunting tribes tended to regard land as held by the local group in a vague sort of common or joint tenure, though tribal boundaries were often defined rather exactly and protected against outsiders. In some parts of Australia, an especially strong sense of group proprietorship strengthened by religious precepts bound the tribe in "indissoluble bonds" to its native soil; and ancient Hebraic law taught that land belonged to God and temporary human "ownership" should be considered in the light of a lease. Some pastoral peoples, feeling that land itself had only "derivative values,"[18] concentrated private property rights in their animals. Tillage societies varied widely in their ideas about property, but many (especially in the Americas) felt the land to be a common "inalienable" possession of which the tribe members enjoyed only the usufruct for a set term or during use. A form of feudal tenure existed in Africa, where the rulers usually had some sort of superior right in the land.[19] Insofar as a trend can be observed, land tenure seems to have evolved from tenures in common or by groups, with extensive cultivation, to more individual tenures and more intensive cultivation.[20]

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[17] As Ely says, "The very words of this theory point to the permanent basis of property in social utility, and they indicate the nature of its evolution. . . . Property exists because it promotes the general welfare, and by the general welfare its development is directed. . . . It is a theory of social evolution, because as society is in flux property can accomplish its ends only by a corresponding evolution. It is a legal theory, because property in itself implies law. . . . At the same time, the words used to describe the theory show that law cannot be arbitrary." *Ibid.*, p. 456.

[18] Carl Brinkman, "Land Tenure," in *Encyclopædia of the Social Sciences*, vol. V, p. 76.

[19] Much of this discussion of property rights among primitive peoples has been adapted from Lowie, *op. cit.*, chap. IX.

Landed Property in the Ancient World. In the ancient world, forms of landed property known in primitive societies were modified, rather than discarded. Usually they became more regularized into formal systems, sometimes with great complexity and variation. Poorly integrated "village economies" were customary, with here and there a city functionally more like an oversized town than the modern financial metropolis. The most important trend of the period was the Roman change from small farms to large slave-run estates, and then to estates with free tenants, an innovation which foreshadowed later European feudalism.[21]

Landed Property in the Feudal-Manorial System. The chief reason for the rise of the feudal-manorial system was the feeling of insecurity which the average individual experienced because of the lack of a well established system of law and order after the decline of Roman civilization. In this new system, the individual gave up many of his personal rights in exchange for the physical and economic protection afforded by group or village life and the self-sufficing activities of the manors.

The feudal system set up a complex pattern of interdependent rights and duties of protection and obedience affecting landholders. There were three chief types of tenure—(1) Possessions in *allodium* (lands outside the feudal system, passed down in the same family from early times, through inheritance); (2) possessions in *villein* or *servile* tenures (where the usufruct was enjoyed on condition of rent or service payments to the lord of the manor);[22] or (3) possession in *fief* (enjoyment of usufruct on condition of knightly services, as distinguished from *villein* service.[23] Complex overlapping tenures developed, with the land belonging, in the last analysis, to the king, though in fact each domain or "seigneury" resembled a petty state, with little actual centralization of power or ownership in the kingdom.

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[20] Much has been written on the subject of the development of property rights in land among primitive societies. Much vague terminology—for instance, in regard to such terms as "common" or "joint"—has been used, and accurate records of these early societies are not available, so that generalizations are difficult to make. It is probably true in most cases that ideas of property acquired increasing refinement, detail, and complexity, or underwent "progressive particularization," just as man's goods and machines and literature grew more complex with increasing civilization and culture.

[21] For a more complete discussion of this period, see N. S. B. Gras, *A History of Agriculture in Europe and America,* Crofts, 1940.

[22] These rent or service payments have been classified in various ways. Rights to payments or services which the lord might claim were classified by Herbert as (1) servitudes, (2) payments or services rendered in money or in kind, (3) seigneurial monopolies, and (4) jurisdictional rights. (Sydney Herbert, *The Fall of Feudalism in France,* Stokes, 1920, chap. I.) Another classi-

The variety and complexity of these tenure arrangements gave rise to a managerial or bailiff class, especially in Germany.[24] In this period the Church became a great landed proprietor; and church lands, generally exploited like lay lands, were managed by the *advocatus* (similar in function to the bailiff or manager on lay lands). Servile or villein tenants on church lands possessed fewer rights, ordinarily, than those on lay lands; but the powers of most lords were very broad. The term "exploitation," originating in this period, signified the lord's right to take revenue and services from the peasants, yielding them in return only possession and a measure of protection. Furthermore, as central sovereignty became weaker or fell into partial disuse, property rights in a measure replaced it, and most types of tenure became hereditary.

The manorial-feudal system began to decline in strength after 1300. The rising town economy afforded a market, and offered tenants alternative opportunities in the form of the professions, trade, and, later, in manufacturing. The lords of the manors found returns growing insufficient to meet disbursements, and desired cash, rather

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fication of rents demanded of manorial tenants included (1) *redevances,* (2) *banalities,* (3) *prestations,* and (4) *corvées. Redevances* were general or recurrent charges paid either in money or produce; or they might be charges on certain acts—that is, toll and commerce fees, or inheritance charges. *Banalities* (actually a form of redevance) were monopoly charges originating in the lord's power of proclamation (the "ban"), and included charges for the use of the lord's mills, forests, or weights and measures, and certain court charges in connection with his power of justice. *Prestations* included the lord's right of seizure, his right of credit (usually limited) and his right of demanding food and shelter from his tenants for himself and his attendants. *Corvées* were rights to the labor of the tenant. (Charles Seignobos, *The Feudal Regime,* Holt, 1926, chap. I.)

[23] There were various types of fiefs. One might be a "tenant-in-chief," holding land direct from the king, or a "mesne tenant," holding it from some intermediate lord. Tenants might perform "knight-service," or under "free socage" tenure perform peaceful services or pay money rents. Special duties (often trivial or nominal) at the king's court were assigned to tenants in "grand or petty serjeanty"; and a church might be a tenant by "frankalmoign" or free alms, performing services for the welfare of the donor's soul. (H. W. C. Davis, *Medieval England,* Clarendon Press, 1928.)

[24] J. W. Thompson, *Feudal Germany,* University of Chicago Press, 1928.

than payment of goods in kind. This caused an increase in the use of *quit rents* (rents paid by the tenant to be quit of a given service). A decline in the value of money made the old fixed rentals and other fixed dues insignificant. Military obligations were generally abolished, and the other obligations that remained were so slight that "virtual free proprietorship was imperceptibly established."[25] The Black Death greatly reduced the labor supply in the fourteenth century and caused a rise in wages and prices. While the manorial lords were becoming more and more unable to meet competition, the peasants, with increasing alternative ways of earning a living, revolted against the manorial system. Serfdom diminished and wages remained higher. These developments were accompanied by the enclosure movement.

The Enclosure Movement. The enclosure movement was a process of consolidating the small, scattered plots of land in the open, unenclosed fields of the manor into more efficient fields. The manor had been characterized by the fact that each tenant's holdings were usually distributed over various fields, often separated from the holdings of other men by nothing more than a small ridge of earth. In order to offset higher wage costs resulting from development of towns and industrial economy, to initiate new cultivation and production methods, and to reduce disputes, these strips were consolidated and hedged or fenced.[26] However, the dispossessed serfs were forced to migrate to the towns, or add domestic weaving to their ordinary activities in an effort to make ends meet. Prices and rents continued to rise, and manorial lords sold lands to the more capable serfs or to people of the towns who desired land for speculative purposes. In this way, a system of free proprietorship came into existence, and owner operation or a system of renting was established. Meanwhile, as trade and manufacture continued to develop and a commercialized system of production for sale and profit became established, land tended to lose the status as the most widespread form of material wealth, or the sole source of wealth production, which it had had during the manorial period.

Landed Property in Modern Societies. Changes and transitions in modern forms of landed property have varied greatly among the different nations. In general, the privileges which property in land give the owner correspond quite closely to the stage of economic development of society. In more backward or conservative regions, feudal principles of land tenure tend to resist the dissolving tendencies of modern finance capitalism and tend to establish complicated systems of exploitation by middlemen, and intricate credit relationships. The struggle for political influence between large estates and small units with more independent cultivators seems to have been fairly continuous. From time to time, attempts to communalize land have been made, parallels usually being drawn between such attempts and the supposed "primitive communism" of early societies. However, in nations where modern capitalism has achieved its greatest development, free proprietorship has developed and landed property has, in general, been put on the same basis as personal property. In other words, the owner is a proprietor free of the necessity of paying rents to anyone; and he may sell the land, mortgage it, lease it, or do with it what owners of personal property may do with their possessions. This is the kind of land ownership so familiar to American students.

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[25] Gras, *op. cit.*, p. 261.

[26] Chapter VII in Gras' *History of Agriculture* gives a rather detailed analysis of the enclosure movement in England.

In Europe, free proprietorship in land developed from the semimanorial system. France set up a free proprietorship system at the time of the French revolution. In Russia, the Communist Revolution of 1917 offered the peasants an opportunity for private proprietorship in land, but in the following year all private property in land was abolished and the land passed to the use of those who would work it. Title was vested in the Soviet Republic and the use and management of the land entrusted to the soviet organization of the district.[27] A later law, while maintaining state ownership, established the family's right to withdraw from soviet control and use the land, therefore, more or less as they desired. Among primitive German tribes, land ownership carried with it certain responsibilities to the social group and to the family, which were above the rights of the individual owner. When a peasant died, it was understood as a matter of course that his estate was an indivisible whole, and that it belonged to one child—either to the oldest or, where *ultimogeniture* (inheritance to the last-born, or the opposite of primogeniture) prevailed, to the youngest. Though the development of commerce and technology emancipated landowners from the earlier traditional views, giving the landowner legal freedom to dispose of his land as he saw fit, he continued to effect arrange-

[27] *Ibid.*, p. 265.

ments to assure the alliance of blood and soil from generation to generation.[28]

Land systems might be divided into free and unfree proprietorships. Unfree systems are characterized by the fact that some group or individual stands between the individual cultivator and the state. In the case of an allodial holding, it was the undivided family; in communism, the village group; in the manorial-feudal system, the lord and, to some extent, the family and the village group.[29] Family and village are no longer strong land tenure institutions in the more advanced nations, where the only rivals of free proprietorship are the landlords, who possess great economic strength, under modern finance capitalism.

Landlordism has undergone great changes in recent centuries. When the tenants of the manor became free proprietors, lords became landlords by retaining their demesne holdings (the lord's special property on the old manors), by purchasing more lands to rent out to tenant farmers, and by family marriages to build up huge estates. The Scully estate is a modern instance of this landlord concept transplanted from Ireland to the central United States. A detailed scheme of tenant obligations and landlord relationships has been worked out and stipulated in the leases.

In Mexico, the attempt to substitute free proprietorship for the landlordism which had developed was the issue in the revolution which overthrew the Diaz government and brought about legislation limiting the size of holdings in some areas according to the nature of the land.[30] In several European nations after the First World War, many land reforms were undertaken which had as their main purpose expropriation of the lords' estates and the distribution of these estates among small farmers, tradesmen, peasants, and others. Conflict between agrarian interests who wanted free proprietorship and the socialists who wanted public ownership developed in several of these European countries. For the most part, the tendency toward small proprietorships has been dominant and the landlords have had a rather serious time of it. In the United States, the depression of the thirties and a corresponding lack of economic opportunities in industrial areas temporarily reversed long-time trends, causing a considerable back-to-the-land movement and an emphasis upon small individual proprietorships, subsistence homesteads, and more emphasis upon agricultural self-sufficiency.

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[28] Heske states that this concept, which persisted into the nineteenth century, arose from traditional beliefs concerning the essential basis for a permanent existence of the race and the state. When it became legal for the peasant to dispose of his farm as he saw fit, he entered into a contract with his heir, turning the farm over to him and determining what the residuary legatees were to receive, in this way assuring the continued alliance of family and land. (See Franz Heske, *German Forestry,* Yale University Press, 1938, pp. 231-233.)

[29] Gras, *op. cit.,* p. 265.

[30] *Loc. cit.*

The landlord system, small proprietorships, and public holdings are at present contending for the dominant position in different parts of the world. Study will indicate that each has its merits as well as demerits, but different peoples may favor one or another, and undoubtedly each of the three systems, or modifications and combinations of the three, will continue to be used. Together they provide the basic alternatives for social change. In the United States, particularly, we shall undoubtedly see in the years ahead many struggles among proponents of each of the three.

LAND AS PROPERTY

Land possesses four major physical characteristics of particular interest to land economists: (1) originality or non-reproducibility, (2) indestructibility or permanence, (3) immobility, and (4) wide variability or graduations in quality. These characteristics distinguish land from various types of capital goods and give those who control the rights to use it peculiar economic, social, and political advantages or disadvantages. Some of these social and political implications will be discussed in this section and the economic implications will be discussed in the following chapter.

The relative permanence of land has caused the development of certain legal arrangements concerning property in land, such as inheritance of land through *bequest* by will, *entail* (cutting off the heirs general and conferring the inheritance right on some particular heir or line of descent), and *primogeniture*. Deed restrictions which bind future users of the land for indefinite periods, and consequently reduce the land's usefulness, have been upheld as legal and proper rights of landed property by the courts. The perpetuity of land has given peculiar significance to the recording of deeds or titles and the transfer of titles, mortgages, leases, liens, and other instruments pertaining to property rights in land. Because of the legal requirements for securing a clear title, these records have become voluminous after the passage of many years, in the longer-settled countries or, in the United States, in the older New England or Atlantic seaboard settlements. Even in the western United States a modern abstract of title may be more than a hundred pages long, in spite of the relative youthfulness of the area, since in this region mobility in land ownership has been pronounced. The problem of maintaining an accurate record of all deeds or contracts affecting title in lands becomes increasingly serious as the nation grows older.

Surface, Subsurface, and Supersurface Rights in Land. Although property in land is measured, purchased, and sold on a space basis, in terms of surface measurement, it does not always convey to the American owner all surface, subsurface, and supersurface rights. Ownership of the surface of the earth may be quite different from ownership of minerals below the surface or of the air or space above. In fact, different strata of the soil may be owned by different individuals. In China, for example, where tenancy prevails in one form or another, the land is owned in partnership between the landlord and the tenant, the landlord owning the so-called "farm bottom" or space of the field (the land exclusive of the surface), while the tenant possesses the farm surface or fertile soil, comprising improvements made or labor spent in developing the land into a cultivated farm.[31]

Separation of ownership of the land surface from ownership of underlying strata often gives rise to conflicts when the property owners attempt to enjoy their individual rights. Both the surface owner and the subsurface owner have certain overlapping or joint rights to the surface land, such, for example, as the right of ingress and egress and trespass at all times, or the right of partition.[32] Separation of surface and subsurface fee is a relatively recent development in the American land system and the courts have not yet fully agreed on the nature of the legal interest created by subsurface conveyances or numerous other points of conflict that arise in the splitting of the fee.

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[31] Traditionally, in China all farm lands are supposed to be barren and are brought to life and fertility by gradual development and cultivation by the farmer. This explains why the farmer is entitled to the surface of the farm. In other words, the fertility of the farm is the sole property of the tenant who cultivates it. This concept represents a definite modification of the traditional, classical concept of the "original" quality of land, in an economic sense. (A. Kanning Chiu, "The Division of Rent Between Landlord and Tenant in China," *Journal of Farm Economics*, vol. VI, no. 4, October 1929, pp. 651–653.)

[32] James Salisbury, Jr., and Leonard A. Salter, Jr., "Subsurface Resources and Surface Land Economics," *Journal of Land and Public Utility Economics*, vol. XVII, no. 3, August 1941, p. 278.

Modern aviation has necessitated modifications in the old English law which held that ownership of the surface carried with it rights to the soil down to the center of the earth and indefinitely upward, above the surface. In the United States, the federal government has the right to control aviation as part of its power to regulate interstate commerce. Frequently rights to the air over land crossed by planes are purchased; and this form of air right has also been used by skyscraper owners who do not want other high structures to shade or interfere with their buildings. In other words, land has become a commodity that can be divided into numerous surface, subsurface, and supersurface rights.

Waning Social Importance of Modern Land Ownership. In early times, a man's wealth and social position were closely related to the amount of landed property which he held. In the early American colonies, only landowners were allowed to vote, and in many places today the same rule applies, particularly where an issue involving the raising of revenue through property taxation is involved. In the First World War, the political privileges and social advantages historically connected with land ownership caused Russian soldiers to abandon their positions at the front and return home, to secure a small acreage allotment promised them by the revolutionists.

The explanation of why landed property has historically carried with it certain political or social privileges may be found in the fact that in the earlier, more primitive agricultural societies land was more directly the basic factor in production. In other words, the production process was a simpler one of incorporating labor with land to produce directly the things for the household.[33] Today, industrial technology has made such astounding strides that land as a factor in production has become relatively less direct. For example, the use of fertilizers may lessen, to some extent, the importance of the climatic characteristics and natural productive qualities of the land. With every successful advance in agricultural technique, the number and importance of uncontrollable variables diminish, so that there is an increasing proportion of mobile capital (such as machinery and other investment costs, excluding site cost) in the total. Landed capital and the operating conditions tend

[33] Charles Abrams, *Revolution in Land,* Harper, 1939, p. 201.

more and more to approach the ideally controlled and predetermined conditions of the laboratory experiment or modern large-scale industrial production. The growing of hothouse vegetables is an example of this tendency, and some of the implications of the modern farm chemurgic movement illustrate the possible dwindling importance of land, in the more primitive sense.

These developments have reduced the relative direct importance of land as a factor in production, and account for the waning social prestige and privileges associated with modern land ownership. In fact, the rise of modern finance capitalism and the pyramiding of economic power accompanying the methods of financing and managing modern industrial corporations, through the mechanism of paper stock equities, have caused land to lose its privileged position. There is a widespread tendency to avoid ownership of land because of the economic burdens of land taxes and the inflexibility characteristic of capital tied up in land. Liquidity is the new key word of modern corporate industry, and is represented by an increasing proportion of stocks and bonds—that is, intangible property. Intangible property is ordinarily not taxed directly or, if so, very lightly, leaving the burden of property taxes to be borne largely by land, both urban and rural. The concentration of economic power in industry has given more and more price-making influence to the more potent interests. "Sticky" industrial prices have accompanied the rigid control inherent in modern large-scale machine production, which is in sharp contrast to the highly variable farm prices which accompany fluctuations in output caused by weather and the large number of individual competing farm operating units.[34] There has been a widespread tendency for rural youth to move to the cities to get jobs in industry or to go into the professions. Investors have preferred putting their savings in more liquid forms of property, such as stocks and bonds, than in farm and urban real estate.

[34] Corporate farming has not developed along with the development of the corporation in industry, primarily because the family-sized farm unit seems to be comparatively efficient in producing food and fiber at low cost so that the commercialized large business unit has not found the agricultural field economically enticing. Another reason is found in the fact that production in agriculture cannot be concentrated on a small city lot or block, story upon story, but requires for a large-scale output a comparatively large area in acres, which increases the difficulty of managing this extensive area as efficiently as a small concentrated factory can be managed.

The social implications of these shifts which have accompanied the technological advances initiated by the Industrial Revolution, and their economic complement, the modern corporation, are far-reaching. In a rural agricultural economy, primary or face-to-face relationships predominate and certain social customs, taboos, and attitudes maintain relatively stable communities. In modern industrial economies, secondary group relationships predominate, and the personalized social ties and bonds of rural communities are lost in the highly impersonalized large modern city.

Ownership of tangible property carries with it a personalizing element which has a stabilizing social effect. Ownership of impersonalized, intangible property like stocks and bonds does not carry a similar active interest and concern of the owner. Agrarian unrest has been greatest where attachment to the land through owner operation has been least, or where ownership has been associated with such heavy economic burdens of mortgage debt or taxation that the economic advantages of property are practically destroyed.

"Land Hunger." These phenomena are often cited as evidence of an "instinctive" trait in man, referred to as "land hunger." It is true that where custom and long and close association with the land have created a respect, understanding, and love for the soil, man will often cling to the land even though he has other more lucrative alternatives.[35] Thousands of individuals who have lived in cities all their lives probably have little real desire to own land, either rural or urban, as such, and do not feel any innate desire to live on the land. However, many of those closely associated with the soil under economically and socially satisfactory conditions do feel a very close affiliation and loyalty to the land, which few capital goods can command. This is particularly true among peasants of the older nations, especially in Europe. In America, the higher percentage of farm ownership among foreign-born whites than among native-born whites is evidence of the psychological, social, and economic importance which these people place upon land, and their resulting desire for it. This desire has been increased, in many cases, by the fact that although they had been associated closely with the land they could not satisfy their desire for land ownership in their native land, or could do so only with great difficulty and sacrifice. This was particularly true in the case of Russia, before the First World War.

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[35] In Greek mythology, the story of Antaeus, son of Poseidon and Ge (symbolic of water and earth, respectively), and his combat with Heracles is an interesting example of the earlier reverence for the soil as a foundation for human life. Heracles, the powerful, was unable to overcome Antaeus in combat until he discovered that Antaeus had to touch the earth periodically in order to retain his strength. By holding him off the ground, Heracles was able to win the fight. The formation of Antaeus clubs or societies, with invitations for membership extended only to those who are practical or "have their feet on the ground" is a modern interpretation of the Antaeus story. In modern impersonalized society, the complexities of life in a scientific and technological world have made many professional workers appear theoretical or academic in the eyes of the average businessman or farmer, who feel that these men have no solutions for present-day problems. The Antaeus clubs are attempts to call attention to the necessity of more realism and practicality, which a deeper appreciation of the soil and the simpler type of life on the land can give.

The Landowner's Role in Modern Society. Two main types of value account for the worth of land, namely use value and scarcity value. Of these two, the landowner asserts his greatest influence over scarcity value. Use value of land depends upon two qualities —*fertility* and *situs*. *Fertility* is primarily dependent upon the natural physical characteristics of the land as endowed by nature, although the landowner, by skillful management and enterprise, can improve this fertility, or destroy it by poor management. *Situs* is that quality of land resulting from its location relative to the preferences of society. and site value can only be created by society, not by the landowner. In the creation of scarcity values through an alteration in the demand and supply relationships of land, however, the landowner has certain reservation prices for his land which cause him to withhold given tracts of land. This establishes a supply curve and influences the final price of the land. The landowner also usually holds land out of production or use until demand for it has developed, and in this intermediary stage the landowner stands the costs involved in the land's ripening into use. Society, in a systematic and organized way, could do all of the things done by the landlord or private owner; but the fact remains that it has not done so, preferring to leave them to be acomplished by the landowner through the institution of private property.

John Stuart Mill, Ricardo, Henry George, and others predicted that landlords in time would become increasingly wealthy and powerful; but these men did not foresee the development of our modern corporation and monopoly capitalism, and the consequent decrease in the relative importance of land in production. In other words, in modern economies land has become less important because of the great increase in substitution of capital for land in the roundabout production process. Ironically enough, most agricultural programs in modern nations deal with subsidizing or bolstering farm incomes, rather than devising ways and means of extracting large "unearned increments" from landowners.[36] As a matter of fact, public ownership of agricultural and urban land through tax and mortagage foreclosures has increased in many areas, not because of excess profits from the land but because of excessive losses incurred by landowners with resultant reversion of landed property to public ownership.[37] This reflects the distressed condition of many landowners and their inability to continue to meet the social costs involved in private ownership of these lands.

The social effectiveness of permitting land to be owned by private individuals cannot be questioned on the grounds that experience has shown that it has given landowners generally a strangle hold on society which they have used to exploit the masses and make great fortunes for themselves. There have been instances, however, of excessive exploitation of the public welfare by landholders in all types of land resources and more particularly in certain minerals. The present distressed condition of landowners in many leading nations is evidence that in general they have not fared as well as many of those who have secured property rights in some other forms of property in modern society. The question of whether land should be owned by private individuals should be decided on one basis—that is, whether or not such ownership tends to secure the socially most efficient and desirable utilization of land resources.

SOCIAL CONTROL OF LANDED PROPERTY

Rapid technological developments in recent years have changed methods of producing and living, and have caused problems and conflicts necessitating continual adjustments of rights and privileges in the use of land resources. These adjustments have involved an increasing number of social controls to secure well-being and maximum harmony among various economic groups within the economy.[38] While government action in many cases does facilitate the necessary adjustments, it may prevent or delay readjustment to changed economic conditions, depending upon the type of program effected.

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[36] An analysis of the nature of land rent and the meaning of "unearned increment" will be found in Chapter VI, and of Henry George's single tax and other problems of land taxation in Chapter XVI.

[37] For example, in Montana more than 4 million acres of agricultural land were taken by county governments from private ownership through tax-deed foreclosures during the thirties. This is the equivalent of one-twelfth of the total taxable acreage in the state.

Land is fixed, immobile, and the source of the foods and fibers necessary for life. Furthermore, since so many of our resources (like minerals) are exhaustible, it is particularly dangerous for any society to allow unregulated, unbridled private property rights in land. These points emphasize the desirability of directing the modern social control movement toward more effective control of landed property. It is, therefore, important to consider the meaning of social control, to analyze the formal and informal controls that are available for this purpose, and to appraise their relative effectiveness as instruments for such control.

The Meaning of Social Control. The word *control* means to "exercise restraining or directing influence over or, more briefly, to coerce." This coercion is usually applied by means of orders or accepted, established procedures backed by irresistible power ("irresistible" in the sense that the agency or group which has such power is in a position to make the penalty for violation of the orders or procedures so severe as to make anything but obedience economically undesirable or unwise). One may choose to break the law, if willing to take the consequences; but the state—the sovereign power in modern societies—sets penalties for violations so high that anyone who wishes to survive economically or physically with any degree of freedom must abide by its orders.

Control may be direct, consisting of legislation with stated conditions of enforcement and penalties for violation, or indirect through less obvious, but effective, inducements like the use of example, custom, and opinion.

Social control is that control exercised by or in behalf of the entity we call society. The concept of "society," however, is not too clear.

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[38] The trust movements and antitrust laws; developments in irrigation, reclamation, and flood prevention; labor legislation, social insurance, minimum wage laws, and compulsory arbitration of industrial disputes; and growing control over public health, markets and marketing, city planning and zoning, and agricultural production have developed within the structure of modern industry. The many-sided movement toward control "must be guided and directed, its movements made more informed and enlightened, but it cannot be stopped and no one group can dictate its course." (For a more detailed statement of developments along these lines, see J. M. Clark, *Social Control of Business,* McGraw-Hill, 2nd ed., 1939, pp. 4ff.)

Society is, of course, an aggregate of individuals, interests, and groups which, though organically bound together, are still distinguishable.[39] Control by pressure groups or specific interests within the social order should not be confused with "social control." Where such group control causes no serious conflicts of interests or standards among different groups, it may be regarded as part of the entire system of social control. The nation itself is not really the whole of society, because some of its interests conflict with those of other nations; but for the most part the nation is a grouping adequate for most purposes. In the United States, the township, city, county, state, and federal governments exercise among themselves the formal legal powers of control in economic life.

To question whether governmental control in such a society is really social is to question whether the government is truly representative of the various interests and groups in the nation. Of course, the more inclusive the group, the more nearly socialized is the control which it exercises; but it is only fair to say that in modern, highly complex, interdependent societies like ours, all controls are imperfectly comprehensive or imperfectly representative, or both, and therefore imperfectly social.[40]

The Quasi-Social Character of Governmental Control. The expressions, "We are the government" and "The government is the people taken en masse," are survivals of the classical concept of the state as the sum total of individuals within it. Modern states, even in the most democratic nations, are separate entities—abstractions apart from the group of individuals within them. When the modern state acts, some official really does the acting. This person has his own particular prejudices and loyalties; he is an agent who executes the orders of his superiors, and his superiors have other superiors, and so on, up to the heads of departments who interpret and enforce laws passed by state or national legislatures, or enforce rules or regulations of county or city councils and commissions. Moreover, these laws, rules, and regulations may have been established by some pressure group through logrolling, compromise, and related political techniques. In any case, there is a considerable margin of discretion within which the official or administrative agency acts to interpret and enforce the law; and within this margin, the official or agency *is* the state—at least for all practical purposes. Officials in

[39] *Ibid.*, pp. 7–8.

[40] *Loc. cit.*

action constitute the state in action, and relations between officials and private citizens determine relationships among the citizens themselves.[41]

It would be logical to believe that private property would be abolished through the usual social processes if it did not serve the general welfare. However, this assumes a smoothly-working, efficient government which promptly and completely reflects the will of the whole people. We have seen how half-social governmental or state action may be, and we have seen that this characteristic is inherent in our modern representative government. Consequently, it is possible for an institution like private property to continue for some time without abolition or significant modification, because the "social control" may not be truly social. After a time, however, this situation should correct itself, although we may find that other forces, controls, or pressures may cause the continuation of private property in land or other objects, even though this might not produce the best results for a given period. In these circumstances, general welfare in the broadest sense would not be achieved. However, confidence and participation in modern social living demand the view that public interest will ultimately carry the day.

Essentials of a Good System of Social Control. Controlling landed property in the interests of the general welfare is a complex and difficult task. The major social purpose of controlling landed property is to secure just, wholesome, efficient, and generally satisfactory utilization of natural resources. In deciding whether to employ formal or informal control, positive or negative pressure, and command or prohibition, three things must be considered: (1) the nature of the ultimate source of control, (2) the nature of the resistance to be overcome, and (3) the amount of independent discretion which can be safely entrusted to the official agents.

Clark lists eleven characteristics or tests of a good system of social control.[42] One of the most important of these is that it be capable of progressively raising the level of mankind. In a democracy where the mass of mankind does the ultimate controlling, this really means that social control must somehow rise higher than its source. This is possible, through the occasional power of enlightened leadership, but not easy.

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[41] John R. Commons, *Legal Foundations of Capitalism*, Macmillan, 1924, pp. 122–124.

[42] These eleven are: (1) be democratic, (2) know what it wants, (3) be powerful (powerful enough to make an unwilling minority obey the will of the majority), (4) be efficient, (5) economize coercion, (6) utilize all the strongest and most persistent motives of human nature, both generous and selfish, (7) impose duties simple enough to be understood (which means that social control must follow precedent much of the time), (8) be guided by experience or be wisely experimental, (9) be adaptable, (10) be far-seeing, and (11) be capable of progressively raising the level of mankind. See Clark, *op. cit.*, pp. 16–17.

Social Control Procedures. In brief, private property is a social trust, and the individual is nothing more nor less than a steward taking care of the property during the period when society approves and permits such stewardship. The social right to regulate and confiscate private property is basic to the institution of property itself. Society always has the last say in determining the limitations and the privileges which property bestows upon its owner. The instruments for such control available to society constitute the *safety valve* in modern economic development and progress.

Society uses controls of two major types—*informal,* and *formal. Informal controls* are those developed by economic groups out of their own needs and qualities, but not formalized through governmental machinery as are statutes or laws. These informal controls, including custom, tradition, religion, education, public opinion, propaganda, and the whole temper or point of view of a class, an organization, or a profession,[43] are important forces determining attitudes toward property and practices developed in utilizing it. *Formal controls,* comprising those formalized by governmental action through legislation in the form of laws or statutes, may be divided into two types: (1) those which the courts develop during the settlement of disputed cases, through their interpretations of and decisions in regard to statutes and legislation, and (2) those which are the direct result of legislation changing men's relations with each other in the use of property and natural resources.

Legislation is greatly influenced by informal controls, through the process of judicial interpretation and development, as well as through the legislative process of making the laws. The effective enforcement of formal controls (particularly of legislation) is greatly enhanced when formal controls are supported by a sympathetic set of informal controls. Thus, informal controls are the foundation of modern control systems because of the necessity of relying on voluntary obedience in most cases, and because of the lack of social solidarity and the importance of minority attitudes.

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[43] *Ibid.,* p. 201.

Informal Controls. Though informal controls have many advantages over government action in the guidance and direction of rights and duties pertaining to ownership, they possess some disadvantages and weaknesses. Among their advantages are: (1) cheapness—no monetary support in the form of governmental taxation is ordinarily required; (2) promptness; (3) discrimination among cases according to numerous circumstances which would be irrelevant in a court but which affect the equities of a particular dispute; (4) efficiency—for example, the pressure of public opinion is felt even by those whose misconduct is still their own secret. The more important disadvantages of informal controls may be summed up thus: (1) when, for any reason, informal controls cannot act promptly, they often do not act at all; (2) informal controls like public opinion are often swayed by the spectacular, and discriminate on personal or sentimental grounds which have little to do with the economic implications of the case. They need formal institutions to give them consistency, persistence, rational regard for consequences, and the advantages of expert knowledge.[44] Furthermore, where the social group is large, solidarity or uniformity of attitudes does not prevail, and minority attitudes, because of their vociferousness and ability, may be more influential in affecting the direction and extent of social control than the attitudes of the majority, who may be passive or poorly organized.

Custom. The unwritten rules, the habits, or the whole body of practices or conventions which become the usual practices or usages regulating the social life of a group are so familiar that their significance is frequently underestimated or escapes observation altogether. However, custom is one of the most important of all forces exerting informal control, and customary ways of using natural resources and habitual attitudes toward the privileges and duties of land ownership are potent aids or handicaps in regulating the use of the resources of any system. This depends, of course, upon whether regulation represents an attempt to prevent a change in present practices or to develop a new practice.

Tradition. Unwritten transmission of information, opinions, practices, customs, etc., from ancestors to posterity also control land utilization practices and attitudes toward the social control of landed property. They may be distinguished from custom largely because of the fact that traditions are considered longer established. While traditions have been handed down from previous generations over a long period of time, customs may be habitual or usual courses of action, usages, or practices developed within a given generation or followed merely because they are practices of the older generation currently living and active. A certain amount of sentimentality and emotional allegiance centers upon traditions, which may also cause actions or attitudes less justifiable or desirable than those usages or practices established through custom.

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[44] An analysis of the principal merits and defects of the major informal controls is presented by Clark. (*Op. cit.*, chaps. XII and XIII.)

Public Opinion. Public opinion is a term used to express the thought or belief of the social group, or at least of the effective majority. It represents the view, judgment, impression, notion, or idea of the dominant social group. An opinion has less definiteness or certainty than a settled conviction, and a weaker hold upon man's activities or thought than a custom or a tradition. Public opinion is flexible and easily molded through the use of such devices as education, religion, or propaganda.

Public opinion is a composite of many conflicting and varied interests within the social body, and it is sometimes difficult to determine just what public opinion is in regard to some subject, or to be sure that it will function so as to meet the true needs of society. However, public opinion, at least in a democracy, has the ultimate right to say what the true needs of society are and how they should be satisfied, and no one individual or group idea of the public welfare should presume to control it. Moreover, though informal forces such as education, religion, and propaganda have their place in harmonizing group interests within a society and in broadening and unifying public opinion, final judgment of what constitutes true social control rests with public opinion itself.

Education and Propaganda. Though education and propaganda are both important means of regulating informal and formal controls, they differ widely in character. Education tries to serve the general welfare, while propaganda is usually the expression of some group interest. Where education strives to be disinterested, accurate, and fair, propaganda tends to be defensively belligerent or prejudiced, its excesses often encouraging the growth of counterpropaganda or violent social disorder. Education, at least in a democracy, must furnish a fairly equal opportunity to acquire factual and other information as a basis for desirable adaptation to life through intelligent and responsible judgment and decision. On the other hand, propaganda materials are arranged to promote or justify some special doctrine, system, theory, or practice. Propaganda appeals to the emotions for an unqualified acceptance, but education implies a certain comprehension and choice. In borderline cases, it is difficult to distinguish between education and propaganda; sometimes, where propaganda approaches the breadth and sociality of education, it may be a helpful corrective force in shaping public opinion.

Religion. From time to time in history, religious ideals have been uniquely significant social controls. The appeal which religion makes to man's most vital and enduring emotions, ideals, and inner convictions furnishes him with an especially strong incentive to accomplish religious ideals in practice. Moreover, the religious mechanism of most societies has typically been more highly organized and more unified, within the limit of the social organism, than such controls as evanescent, often self-contradictory public opinion which lacks the long-range view, the long-time program, and the relatively constant pressure in one direction which religion affords to social control. Religion has succeeded to a large extent in combining abstract, ideal aims with concrete, practical secular action. Besides striving to modify the individual with a view to his personal salvation, religious organizations have attempted to lessen his egocentricity by inculcating qualities desirable for the good of society as a whole, and by motivating him to act with unselfishness, cooperation, and some sense of social responsibility.

Codes of Ethics of Business and Professional Groups. Codes of ethics, or formal statements of conduct made by business and professional organizations, are powerful forces for those who live under their influence. These codes are private rather than public in character. However, they are given statutory force by the organization propounding them, and in this sense are as formalized as the statutes and laws of political units or governments, for members of the organizations in which such codes are established are coerced by these codes. Whether they comply or not, the attitudes and feelings of their fellows toward the codes constitute a definite source of social pressure.

In our modern society, where so much of our economic life is carried on through economic organizations or special interest groups, the codes of ethics or conduct drawn up by the many business and professional organizations are very frequently contradictory. Many are antisocial, yet some are comparatively broad in their social aims.[45] In any case, this body of codes constitutes a force influencing the actions, attitudes, and practices of owners and users of property.

These informal social controls of a society combine to make up its collective attitudes; and it is these collective attitudes which determine the direction and amount of social control exerted over landed property.

Formal Controls. Among more primitive folk, where a legal system of statutes and laws was not known, the control of property was embedded within the mores of the society. Slow development of government in response to the increasing need of peace, order, and security of contract accompanying more social complexity caused the previously informal controls to be embodied in formal statutes and laws. This trend has been fairly continuous, resulting in an ever increasing body of statutes and laws. Legislation is never entirely original or impromptu, but is rather the expression of public opinion developed through custom, tradition, education, and other informal controls.

Formal control of landed property is exercised by the state or sovereign through the legal framework within which price forces operate. That is, the state formally controls the use made of landed property, the quality of ownership and the number of rights which pertain to it, through laws and statutes which determine how the land may be used or how much profit may be derived from such use. This legislation influences the cost and profit aspects of land utilization which, in turn, determine values attached to land ownership. Formal social control of landed property may be exercised in various ways, but is generally exercised through some form of the *police power*, *eminent domain*, or *taxation*.

Police Power. The police power is the right of government to control property for the use of society in the interests of public health, safety, morals, and the general welfare, without compensation to private owners for any limitations or restrictions so imposed upon private property rights. In the case of the United States, it is that power of the state through legislation interpreted by the courts

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[45] Clark refers to these codes as "a most curious mixture of the more presentable phases of intelligent private interest, class interest, community obligation, and natural human sympathy, wherein altruism is upheld one moment and apologized for the next, and virtue and expediency are inextricably interwoven." (Clark, *op. cit.*, p. 215.)

(this interpretive power is transmitted to the courts by federal and state constitutions) to shape property and contract to existing social conditions by determining what burdens may, without compensation, be imposed by society. Perhaps "police power" should be called "community power" or "public power," since it seeks to serve the public welfare most effectively by preserving a satisfactory balance between the individual and social sides of private property.

In the United States, several levels of government, ranging from federal to municipal, must deal with some aspect of the control and regulation of landed property. This is because the American system of government vests sovereignty in the forty-eight states, except for federal governmental powers delegated specifically by, or implied in, the federal Constitution; moreover, local governments (such as city, town, or county governments) are administrative units established under state laws, exercising only those powers of sovereignty granted or delegated to them by the state constitutions and acts of the state legislatures.[46] There are more than 3,000 of these county governments in the United States, and more than 17,000 incorporated cities and towns, on both of which the states may depend for the execution of certain land use regulations, controls, or plans; but cooperation among the states is essential if any national plan of land utilization is to be effective, since only the states can use the police power and levy property taxes.

Division of powers has an important effect on utilization of agricultural as well as urban land. In contrast to the United States, where sovereignty is vested in the forty-eight states and only delegated or implied powers are given the federal government, Canada vests police power largely in the Dominion government. Since Canadian sovereignty rests in the Dominion government, except for certain powers exclusively assigned to the province legislatures, authority is much more centralized in that country.

Use of the police power varies widely, especially in the United States. For instance, in specifically enumerated cases the federal government has essentially the same powers as the states, which are really the sovereign governmental units. The federal government controls property primarily through the admiralty, navigation, and commerce clauses of the federal Constitution, the entire field of interstate commerce being under the regulatory control of the federal government. Other examples of use of the police power type of control by the federal government include plant and animal quarantine, livestock inspecting, and food inspection. These controls, particularly under the commerce clause, increase in importance as our society becomes more complex, so that the federal government influences the regulation of private property more and more. However, the states have used the police power primarily in zoning legislation so far as land use control is concerned.

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[46] This division of powers between the states and the federal government is stated in the Tenth Amendment: "The powers not delegated to the United States by the Constitution nor prohibited by it to the states are reserved to the states respectively, or to the people."

Zoning as a Use of the Police Power. Adoption of zoning ordinances is one of the most important means of utilizing the police power. The area to be controlled is divided into districts, in each of which certain uses are prohibited. Most zoning ordinances are telescopic in their classification of different kinds of districts, uses not allowed in more restricted districts being successively allowed in each of the less restricted districts. In an ideal zoning ordinance, however, uses of the several districts would be mutually exclusive.[47] That is, residence, business, and industry would each be limited to a particular district. Ordinarily, residence districts or zones are the only ones protected against mixed building, and only in a few cases are residence buildings excluded from industrial zones. In no case are they prohibited in the business zone. It would seem logical that if it is undesirable or unhealthful for people to live near an isolated factory in a residence area, it is equally or more unhealthful or undesirable for isolated dwellings or tenements to be situated in a heavily industrialized zone. Certainly, wholesome homes are not possible when surrounded by chemical plants, steel mills, tanneries, railroad yards, and slaughterhouses. In spite of the many advantages and the great desirability of exclusive zones, most cities have telescopic zoning. As a result, though zoning has prevented many undesirable uses in certain sections, it has not accomplished the maximum benefits possible in urban land-use planning and control.

Zoning is also used, in some instances, to control rural land uses. In cities, the grounds for zoning are the public health, safety, and morals. For example, placement of billboards at intersections has been prohibited to protect the public from the dangers of automobile accidents under modern motor traffic conditions. Sanitation or public health and safety have been important bases for limiting the height or bulk of buildings. In the case of rural zoning, economic grounds are used to justify regulation of rural property. For example, in the cut-over Lake states, the necessity of reducing local governmental expenditures for schools, roads, and related services in order to reduce tax delinquency, tax deeds, and corresponding distress has given rise to zoning for the control of settlement and land use.

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[47] National Resources Committee, *Urban Planning and Land Policies,* Report of the Urbanism Committee, Government Printing Office, 1939, p. 329.

Urban Zoning. Zoning ordinances are used extensively as a means of controlling urban land use. The positive effects of zoning ordinances in bringing about changes in urban land use are usually of necessity very gradual, because most zoning ordinances are not retroactive in their effects. No community seems to have been able, through zoning, to meet the difficult problem created by erection of flimsy buildings and shacks on the fringe of the city. Most zoning ordinances require a minimum lot area for a house, a maximum height for the buildings, limitations upon the percentage of lot occupied, a certain setback of buildings from the street, and similar regulations. Most of these are not applicable to the cheap shacks built on city fringes during depression periods or for summer use, because most of these requirements are met. Insistence upon a minimum lot area per house has sometimes helped to prevent the development of shack areas, because, through increasing the land area required, construction of a house becomes so expensive that it is uneconomic, considering the investment in land, to erect a mere shack.[48]

Some ordinances now include a statement setting forth the minimum standard of construction which new buildings must attain, and zoning thus effectively excludes inferior buildings from the community. Building, sanitation, plumbing, electrical, and related codes, while sometimes abused for graft by interested trades, are primarily designed to protect the safety and health of the people by preventing cheap, jerry-built structures of inferior materials and shoddy construction. In spite of the importance of such codes in a comprehensive urban land policy, hundreds of fair-sized municipalities have no building codes at all, and many more have very poorly devised codes.[49] It is essential that reasonable standards of con-

[48] It has been argued that increasing the required amount to be invested in the lots leaves a smaller amount for constructing the dwelling, so that poor houses result. However, it is a matter of common observation that the best dwellings are usually located on the most expensive lots, and not the reverse.

[49] National Resources Committee, *Urban Planning and Land Policies,* p. 272.

struction be provided for, so that building costs do not become excessively high and jerry-building is not permitted. Adoption by the central city of a code which does not apply to suburbs that may have no codes, or codes of varying adequacy, raises certain competitive situations with serious implications. County codes or statewide codes would standardize construction over areas large enough to eliminate ununiform, competitive conditions in the building field. To effect such codes, however, would require closer cooperation between city and county governments or more active participation on the part of state governments than has generally prevailed.

Zoning is being effectively used to control open space about residence buildings, to eliminate dark rooms, land overcrowding, rear dwellings, blighted areas, congestion of population, and constant shifting of residence centers. Regulation of inner courts, setbacks in courts, minimum window areas, percentage of lot occupied, location of accessory buildings, congestion of population, garden apartments, country estates and green belts, front yard requirements, setback of buildings from street centers and on corner lots, setbacks in commercial zones, and height of buildings are contained in many zoning ordinances which, in the aggregate, are improving city living conditions.[50] One of the difficulties in zoning which is characteristic of many cities is the failure to revise zoning ordinances promptly as occasion requires. Mistakes will in all probability be made in the original regulations and in the boundaries delimiting initial zones.

Rural Zoning. In rural zoning, control of land use is not so detailed as in the case of urban zoning, and generally only broad types of use are regulated. In Wisconsin, for example, the enabling act provides for zoning land for agriculture, forestry, and recreation. In Michigan, however, the enabling act has been broadened to include soil and water conservation, and all-year residents may be zoned out of certain areas.[51] Zoning as a land-use control measure is quite effective where patterns of land use are changing rapidly, as in the urban-rural fringe or the forest-farm fringe. Zoning appears to be least effective on already developed, relatively stable agricultural areas, because land use practices and conditions under which land may be used for crops or grazing vary so greatly, even from farm to farm, that it is difficult to set up districts within which uniform regulations apply, because the major need in these areas is for specific land management practice regulation which is handled by soil conservation districts, and because there is no great need in most of these areas for protection from encroachment of other uses.[52] Moreover, if the non-retroactive feature were continued, zoning would not be effective in changing a land use established before the ordinance was passed.[53]

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[50] For an analysis of the use of zoning ordinances for each purpose listed, see National Resources Committee, *Urban Planning, op. cit.*, pp. 334–349.

[51] G. S. Wehrwein, "Rural Zoning," U. S. Department of Agriculture *Yearbook* for 1938, pp. 241–245.

Rural zoning began in 1929 with an amendment of the Wisconsin county zoning law. The law had previously limited county regulation to urban land use. Since the adoption of rural zoning in Wisconsin, several other states have permitted local governments to zone land for strictly rural purposes. State-wide enabling acts for municipal zoning have been adopted by all the New England states, and although they have been designed principally to meet urban and suburban problems, it is believed that rural zoning is possible under their provisions.[54]

Although soil conservation districts may technically be given limited districting and use regulation powers comparable to zoning powers through broadening their present scope of action by statutory amendment, it would be inconsistent to broaden such powers in view of the original purposes for which soil conservation districts were established, unless zoning is limited to the prevention of erosion. Where the problem is one of preventing continued high cost of public services in cut-over areas, rather than one of erosion, zoning has certain advantages as a land use control technique.

[52] Virgil Hurlburt, "Rural Zoning for Missouri?" *Journal of Land and Public Utility Economics,* vol. XVI, no. 2, May 1940, pp. 155–158, and Conrad Hammar, "Regulation or Development for the Missouri Ozarks," *ibid.,* pp. 159–164.

[53] Courts have considered retroactive urban zoning legal, but in most states rural zoning is not expected to be retroactive. However, in Pennsylvania, provision is made for termination of non-conforming uses over a period of time. (See Virgil Hurlburt, "Pennsylvania Planning and Zoning Enabling Acts," *Journal of Land and Public Utility Economics,* vol. XIII, no. 3, August 1937, p. 315; and U. S. Department of Agriculture, "Rural Zoning and Land-Use Planning," County Planning Series, No. 7, Bureau of Agricultural Economics, 1940.) Chapter I, pp. 1–16 of "State Legislation for Better Land Use," a special report by an interbureau committee of the USDA, Washington, D. C., April 1941, gives a thorough analysis of rural zoning, including preparation of zoning ordinances, zoning procedure, administrative regulations, and types and current rural uses of zoning.

[54] For a statement of the development of rural zoning in the United States, see "State Legislation for Better Land Use," p. 2.

Under Michigan statutes, zoning may attempt to counteract soil and water loss, but its techniques are so limited that it cannot be expected to do the same work as a soil conservation district. Grazing districts are obviously limited to a particular type of land use, as are weed control and related types of districts.

Zoning Procedure. Before local governments can pass zoning ordinances to regulate the use of property, authorization must be given them through an enabling act passed by the state legislature. This is done because of the provisions of the Fourteenth Amendment to the federal Constitution, which states, ". . . . nor shall any state deprive any person of life, liberty, or property without due process of law." This is interpreted to mean that zoning must be effected democratically through legal procedure such as state enabling acts and local discussions and decisions. The enabling act is nothing more than a legislative act specifically granting all municipalities or counties the right to zone. Under the enabling act, local governments may proceed to establish zoning ordinances, usually with provision for free discussion and full comprehension of proposed zoning ordinances through public hearings before they go into effect.

Zoning may protect and promote proper utilization, or may restrict improper utilization. Zoning should be regarded as a dynamic science, and a continually evolving process. Zoning regulations are neither in perpetuity nor for a fixed term of years, but continue only as long as they remain unchanged. This elasticity and flexibility has been considered a weakness, because zoning regulations can be changed very quickly with any change in public opinion. However, with proper education and intelligent planning, this elasticity and flexibility are the very characteristics that permit zoning regulations to be promptly adapted to changing conditions. Failure to revise zoning regulations promptly in accordance with changes or new conditions in the utilization of urban or rural land will seriously hamper their effectiveness.

"Taking" of Property by Police Power and "Due Process of Law." The Fifth Amendment states that no person shall be deprived of life, liberty, or property without due process of law, nor shall private property be taken for public use without just compensation. The courts must decide just what constitutes "taking" private property. Any regulation or restriction imposed through the police power upon the utilization of landed property may be literally considered

as "taking" property for public use. For example, zoning may restrict the utilization of a given piece of land or may even prohibit entirely its use for certain purposes. This reduces the income potentialities of the land and diminishes its value. Literally, this is a taking of property, although change is more complete in a complete transfer of the property from private to public ownership.

No sharp line clearly indicates the place where use of the police power ends, beyond which any further regulation or "taking" of property would require compensation. As a matter of fact, in extreme cases the police power may be used actually to remove land from private ownership and withdraw it to public ownership. The term *confiscation* may be used to indicate such taking of property without pay. This practice is sometimes referred to as "robbery by the state." Ordinarily, however, confiscation implies forfeiture of individual rights because of the owner's failure to comply with certain specified legal requirements, so that a taint of illegality is usually associated with it. An example of this is confiscation of automobiles transporting bootleg whisky during the Prohibition period of the twenties in the United States. The confiscation of American-owned and English-owned oil fields by the Mexican government (1928) has also been considered an act of Mexican confiscation, because the property was seized without fair, prompt, and adequate compensation, although the oil lands may have been secured originally by bribing Mexican officials. Had such fair, prompt, and adequate compensation been made, the term *expropriation* would have been used.

The individual property owner has only one recourse when he feels that he has been unjustly deprived of his property. He can take his case to the official board that may have been set up for the individual to appeal special cases, or to the court, where the legality of the government ordinance or action can be scrutinized to determine whether it constitutes "due process of law." If the court feels that the procedure in establishing a zoning ordinance, for example, was undemocratic, or that the ordinance was not really concerned with public morals, health, safety, or the general welfare, and that the individual was actually deprived of his property either partially or entirely, it will decide in favor of the individual and against the governing body attempting to enforce the ordinance. The decisions of the court will, of course, depend largely upon the economic philosophy and point of view of the court. A conservative court will lean in the direction of protecting individual rights, while a progressive one ordinarily tends to protect the public welfare at the expense of private rights.

Although the police power is ordinarily considered applicable only to the control of future land use, and not retroactive, there is no reason why it should not be sufficient to prevent continuance of previously established non-conforming uses. If a certain newly established non-conforming use affects public health, morals, safety, or the general welfare, so would a long-established use of the same type. Theoretically, the police power is broad enough to permit ousting all non-conforming uses, but the courts would undoubtedly prevent such sweeping action.[55] Few cases have come before the courts involving the ousting of existing non-conforming buildings, but zoning ordinances ousting non-conforming cases have been upheld in the courts.[56] While much can be said for zoning ordinances which provide for ousting existing non-conforming uses, retroaction is not a usual feature of zoning. Nevertheless, most state enabling acts do not provide that no regulations shall be made retroactive, and the future development of zoning may show that this power to oust existing non-conforming buildings and uses in certain instances is very important.

Coordination of Police Power Use. Various types of state and local measures have been adopted to control or direct land use through application of the police power in one form or another. These include urban zoning, rural zoning, cooperative grazing associations, soil conservation districts, and weed control districts (see Chapter XVII for an analysis of these types of districts). Much debate has arisen in recent years concerning the relative merits of

[55] Pennsylvania was the first state to include the retroactive principle and under Pennsylvania statutes the discontinuance of non-conforming uses may be attempted, providing certain guides are followed. Bassett contends that "theoretically the police power is broad enough to warrant the ousting of every non-conforming use, but the courts would rightly and sensibly find a method of preventing such a catastrophe." (Edward M. Bassett, *Zoning,* Russell Sage Foundation, 1936, p. 112.)

[56] As early as 1913 the California Supreme Court upheld the Los Angeles Ordinance, ruling that a brickyard established in a residence district before the ordinance was adopted must be removed. (*Ex parte Hadachek,* 165 Cal. 416.) The U. S. Supreme Court also upheld the ordinance (*Hadachek* v. *Sebastian,* 239 U. S. 394). This case really involved nuisance abatement which is always legal and was not decided on bases of retroactivity. In two more recent New Orleans cases a zoning ordinance was upheld ousting non-conforming cases. (*La-Dema Realty Co.* v. *Jacoby,* 168 La. 752, 123 s. 314, 1929; and *Dema Realty Co.* v. *McDonald,* 168 La. 172, 121 s. 613, 1929.)

these different forms of social control of land use through the police power. Many argue, for example, that soil conservation districts can be used exclusively to control and direct the utilization of land in rural areas, and that rural zoning or grazing districts are not necessary. Each of these types of social control has particular advantages or disadvantages for given situations; but the organization of grazing districts, soil conservation districts, zoned areas, and other types of controlling authorities has given rise to numerous overlapping jurisdictions, so that there is a definite need to reorganize land use control functions. Every time a new special unit is created to serve some limited purpose, another community of interest has the force of its public attention diverted from the principal task of securing responsible and responsive local self-government.

Recently, a rough coordinating statute has been drafted which, it is believed, illustrates how zoning and soil erosion control powers can be consolidated. This coordinating statute attempts to consolidate police powers necessary for the various types of local rural land use regulation now in operation, providing for suburban-type zoning, strip zoning along highways, soil conservation, flood control, and other local land use adjustments.[57] The draft of the proposed statute in the article cited incorporates only the main aspects of a complete legislative bill, and reads that "The governing body of any and every county is hereby authorized and empowered, within its non-incorporated portions, to regulate, control and restrict land utilization practices and the use and occupancy, including the conditions of use and occupancy, of land for trade, extraction of subsurface resources, industry, residence, recreation, agriculture, forestry, grazing, soil and water conservation, flood control, and other purposes; and the location, size, character, and use or conditions of use of buildings and other structures." It is obvious that this broad grant of powers would permit application of the police power in all its various forms and for all the major land uses, and would greatly simplify administrative machinery to effect such social control.

Eminent Domain. *Eminent domain* is the right of government to claim private property for state use, if compensation is made to the private owner for property so claimed. In other words, the government may convert private property into public property without consent of the owner, but with compensation. In the United States, eminent domain is an inherent power of the state governments and an implied power of the federal government. The use of eminent domain is limited by the "due process of law" clause in the Fourteenth Amendment to the federal Constitution, just as is the use of the police power.

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[57] V. W. Johnson and H. Walker, Jr., "Centralization and Coordination of Police Power for Land-Control Measures," *Journal of Land and Public Utility Economics*, vol. XVII, no. 1, February 1941, pp. 24–26.

One important distinction between police power and eminent domain is the fact that, as a rule, application of the police power is *general,* while eminent domain affects specific property for some *particular* public purpose. Under the police power, private property may be regulated and restricted in the interest of the public welfare; in the case of eminent domain, private property is taken from the owner for fair compensation and appropriated to some particular use designed to promote the public welfare.

The distinction frequently made between eminent domain and police power on the grounds that compensation is made in the former and not in the latter is not entirely correct; because indemnification or compensation is frequently made, though title to the property is not transferred from private individuals to the public, when the police power is invoked as it is when eminent domain is used. For example, if property is destroyed while a fire department is fighting a conflagration, or if exposed bands of livestock are killed to check the spread of a contagious disease, there is no expropriation—that is, no transfer of title to the public—and therefore no exercise of the power of eminent domain giving rise to a claim to compensation. Nevertheless, although such instances involve only exercises of the police power, legislatures may be induced to provide for compensation as a matter of equity; and this has been done frequently in connection with cattle diseases, fires, and similar cases. But since the right to compensation is not a constitutional right, as it would be under eminent domain, adjustments may be made more equitable toward those who have to bear the burden of compensation, and recognition of the difference between police power and eminent domain is then an important advantage.[58]

The fact that the use of eminent domain, or expropriation, requires compensation to the private owner whenever it is used, while compensation under the use of police power is discretionary and, in most cases, non-existent, makes eminent domain a more expensive means of social control than police power.

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[58] Ernst Freund, "Eminent Domain," in *Encyclopædia of the Social Sciences,* vol. V, p. 495.

In the United States, the power of eminent domain belongs to the federal government as well as to the states. Furthermore, the states may delegate the exercise of eminent domain to local governmental units like counties and cities, and even to private corporations—particularly railroads, telephone and water companies—if the public welfare is best served thereby. Railroad rights-of-way and power company easements are examples of the exercise of eminent domain by private agencies in the interests of the public welfare.

Excess Condemnation as a Use of Eminent Domain. The use of eminent domain is theoretically limited to the purchase of land for public purposes. However, some difference of opinion exists in regard to what constitutes a public purpose. The opening of a new street in a city is obviously for a public purpose. But governments may condemn more property than actually necessary to create a public improvement, and subsequently sell or lease the remainder. This policy, known as *excess condemnation,* may be used to accomplish one or more of the following purposes: (1) To solve the problem of lot remnants. For instance, where construction of a new city street would leave lot remnants on certain parts of the street which would injure nearby owners as well as the city itself, the city might take more than the exact footage required for the street. Ordinarily, the excess area taken under eminent domain not needed for the street proper would be resold to adjacent lot owners, although it might be used by the city for beautification of the area. (2) To protect the beauty and usefulness of public improvements so made. (3) To make money.

This latter purpose seems like a rather improper use of eminent domain, but taking more than absolutely necessary for creation of a public improvement in order to make money by selling or leasing the remainder may be justified on the grounds that the public improvement made greatly enhances the value of adjacent private property, or value of the private property of the city as a whole, and that condemning in excess and using part of the condemned property to make money would substantially offset the cost of the improvement. Another use of excess condemnation is illustrated by cases in which cities buy up from private owners a large number of water rights, not then needed for the present city water supply, but which may be needed ten or twenty or thirty years later, as the city grows or dry years come. In other words, this is a protective device which is a means of securing a very vital commodity for the public use.

Eminent Domain Procedure. Eminent domain, or expropriation, is not limited to purchase of land for public purposes, though it is in land sales that this type of social control has its chief use. Ordinarily, the use of eminent domain does not necessitate actual condemnation and appraisement to transform a piece of land into public property. The usual procedure is outright purchase by the public agency from the private individual, in the same way that all voluntary sales are executed. However, where voluntary agreement cannot be reached between the private owner and the public agency, proper legal procedure has been established to effect the transfer of the private property to public property.

General legislative acts provide appropriate procedures for exercise of the power of eminent domain in most states. A condemnation proceeding instigated by the expropriating agency places the matter with the judiciary, making the case a common lawsuit. In other words, the court intervenes to carry out expropriation. The judiciary is the only authority competent to order occupation of private property, and the judgment or decision of the court in regard to proper valuation of the property and payment to be made the private owner is final. The court may appoint an individual, a board, or a committee to appraise the property, or may itself determine the proper amount to be paid.

It has been customary in the United States to fix the amount at not less than the fair market value of the property. This has been interpreted by the courts to mean the amount which would be paid voluntarily by someone purchasing in good faith a piece of property which another wants to sell. The private owner can, of course, appeal his case from a lower court to a higher court; but in the last analysis the judiciary (either the higher or the lower court) finally determines the amount to be paid by the expropriating agency for the property taken. The expropriating agency can likewise appeal the case to a higher court, if it feels that the amount of payment established by the court is unreasonable.

Taxation. The tax system is usually thought of as a means of securing revenue to defray costs of rendering certain essential or desired governmental services, but it can be a very important instrument of social control, particularly over landed property. Careful planning and efficient administration make it possible to achieve two important purposes of the tax system—to secure adequate revenue for governmental services, and to encourage most efficient and desirable utilization of land resources.

Used as an instrument of social control of landed property, the tax system must be so constructed and administered that it will place on different types and grades of land relative burdens closely approximating their relative productivities. In other words, since assessed valuation is the base upon which tax levies are made, quality or productivity of the land must be carefully considered in assessment. If this is not done, an excessive burden is placed upon poorer lands, with the result that private ownership is untenable and the lands revert to public ownership through tax delinquency and tax deed. The heavy increase in rural and urban tax delinquency in some areas of the United States in recent years is a good example of the forced transfer of private landholdings to public ownership.

Any changes made in taxation of land, either for purposes of social control or to secure more revenue for the support of governmental services, should be made slowly, because of the relatively fixed and immobile nature of land as a factor in production. Nevertheless, if made intelligently and slowly, changes in the tax system can be one of the most important peaceful means of securing better land use and effective control of land ownership in the interests of the general welfare.

Private Legal Controls of Land Use. Formal controls of land use are of three major types—namely, public ownership, private control of private land, and public control of private land. Public ownership requires no explanation since, where the government owns the land, it can utilize the land as it wishes, although government agencies ordinarily can purchase or acquire land only for certain specific purposes. We have seen how society formally controls private land by means of various forms of the police power, eminent domain, and taxation. Formal private controls of private land take the form of deed, mortgage, and lease restrictions, and easements.

Deed Restrictions. Deed restrictions are encumbrances on property limiting the future uses which can be made of it by the individual who buys it. The restrictions may apply over a limited period or over a very indefinite period. They are frequently used by real-estate development companies to insure a certain homogeneity of development or the erection of high quality buildings in a given subdivision. Deed restrictions have been used almost exclusively on urban land, but they have been used to some extent in the development of recreational land. The deed restriction may be applied to single parcels of land or to an entire subdivision. With such restrictive measures, details of setback, density, use, and related developments can be controlled more easily than in a zoning ordinance or subdivision regulation.

The weakness of deed restrictions is that the regulation may be applied only by the owner, so that they are not of general use unless the city, an individual, or a corporation owns most of the area involved. Unless a public agency owns property which it wishes to sell, it cannot effect land use control by this means, but may work out some agreement or understanding with owners under which they agree to include certain restrictions in deeds when they sell their properties. In the case of sale of county or township land acquired through tax delinquency, a clause could be inserted in the tax deed setting forth certain desirable use restrictions on the property. The Federal Housing Administration uses this method, and insures loans for development of new areas only after they have been covered by suitable deed restrictions.[59] Use of deed restrictions is further limited by the fact that the more stringent the deed restrictions, the lower the value of the land, as a rule, except in the case of high quality urban development. There is also the very serious difficulty of enforcing the deed restrictions, because if the restrictor dies, and the next owner has no specific interest in the restriction provisions, there is no one to bring suit to achieve enforcement.

Mortgage and Lease Restrictions. Limitations on the use of land by mortgagors and lessors are more generally used than deed restrictions. Almost no land, urban or rural, is actually leased or mortgaged without some restricting provisions. These are, however, designed to protect lenders and landlords, not, ordinarily, to insure social values and costs in the use of land.

At the present time, society has no technique whereby it can insert desired restrictions into private mortgage contracts or leases, although if this could be done it would be a very useful means of controlling land use. The increase in public land ownership in many areas through tax reversion, federal land purchase, foreclosure of state land mortgages, and reversions through delinquency of irrigation and drainage district levies is increasing the sphere of influence of social control, since where a public agency is a landlord, it can use mortgage and lease restrictions to achieve desired land use practices. There has been a tendency thus far for few public agencies outside of the federal government to take full advantage of these opportunities. However, with greater coordination of land use policies among different public and private agencies, more effective use may be made of mortgage and lease restriction techniques.

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[59] National Resources Planning Board, *Public Land Acquisition, Part II, Urban Lands*, Government Printing Office, February 1941.

Easements. An *easement* is a right to make use of the land of others, whether it be that of the public or individuals, for a precise and definite purpose not inconsistent with a general right of property in the owner, especially where it is for the public use. Easements include the right of pasture on other land, of taking game on other land, of fishing in the waters, of taking wood, minerals, or other produce of the soil from other land, of receiving or discharging water over other land, and many others.

Easements of every kind must originate in a grant or agreement, express or implied, of the owner. One of the most common easements is the granting of a right-of-way by the owner to permit use of his land by someone else for a road, or to construct a power or telephone line on his property, or for some similar purpose. The right-of-way may involve only the use of the air over the land or it may involve surface or subsurface or supersurface rights. Access rights to streams and woods for hunting and fishing are another use of easements. Such easements frequently bring appreciable sums and may not interfere with the regular use made of the land by the owner.

Extra-Legal Procedures. There is another type of social implementation or group control of landed property which alert public or private agencies occasionally use, known as *extra-legal procedures.* These actions are within the law, yet slightly stretching the law. In other words, action occurs that was not contemplated in the law yet is not specifically prohibited by it. For example, in tax delinquency foreclosure procedures the cost of the foreclosure process may be so high that on low-valued properties the county or township cannot afford to foreclose. Consequently, the local governmental unit may get some of the owners of the delinquent properties to deed the land to it. Thus, no foreclosure cost.

Another example of the use of extra-legal procedures is that of a hunting club that wanted exclusive hunting rights to a ten-mile square area so that its members could get a deer each fall. The club canvassed the area and gave each occupant landowner a membership in the club. In return, all the landowner had to do was post his land. The state law prohibits hunting on posted property and provides a stiff fine for violations. Thus, the hunting club has good hunting territory—all within the law, yet stretching the law slightly.

In the adoption of zoning ordinances, public officials may hold extra meetings (uncalled for by statute) in explaining zoning, getting it accepted, and consequently decreasing significantly the enforcement and administration problems later. This is more than good local government administration—it is using extra-legal procedures to good advantage in achieving improved land use.

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CHAPTER FIVE

ECONOMIC PROCESSES IN LAND UTILIZATION

ECONOMIC goods and services are produced, directly or indirectly, by combining one or more of the three factors of labor, capital, and management with land, in various proportions. In reality, this means that all physical goods and services used by man come ultimately from two sources—man and nature. However, the extent to which man utilizes the land resources of the region where he lives is influenced by his power to command these natural forces, which in turn, as we have seen from the preceding chapter, is affected by the state of the arts, the social organization, the character of the institutions (especially property), and the general culture of the people.

Land economics is a branch of the parent discipline—pure economics. The tools of analysis are those of the economist but the data are of the processes of rural and urban land use and appropriation. The economic principles are in general applicable equally to industry, marketing, or land use; but for each field, emphasis or application differs and for that reason requires separate study. Nevertheless, the basic principles of economics are a prerequisite for the analysis of problems in any of the applied fields. Emphasis is placed in this chapter on those principles of economics which are most essential to the land economist. No claim is made for completeness in the development of the principles. Where for the sake of brevity certain steps are deleted the student should refer to an elementary text in economics.

THE PROCESS OF RESOURCE ALLOCATION

Because human wants are insatiable, in the aggregate, and because basic natural resources used to satisfy human wants are scarce rather than superabundant, maximum human satisfaction demands the development of the science of utilizing our resources and our efforts most efficiently. The central problem of economics is the allocation of scarce resources for the fullest satisfaction of ends.[1] In land economics the problem centers around the allocation of land resources and their appurtenances for the fullest satisfaction of the ends of society. Where resources such as air to breathe are abundant no problem of allocation arises; but where they are scarce, and this is the usual situation, choices must be made carefully as to the most desirable use of resources. The allocation process is guided by prices, which are the terms on which alternatives are offered. Prices, as it were, are the rationing agents rising where scarcity occurs to divide the limited resources among those most urgently needing them on the basis of their ability to pay. Price is a rationing force whether freely competitive forces are operating in a common market place where buyers and sellers bid with money prices against each other, or at the opposite extreme, where government decrees establish arbitrarily the terms on which the alternatives (prices) are offered. The difference is only in the nature of the market. The institutional structure of the market may differ and so also the technical relations of the persons and products involved.

Economically speaking, choices are made as to the use of each resource among alternatives, according to varying motives for achieving maximum results. For the consumer, the maximum results will be in the form of utility or satisfaction; for the business man, profit; for the government or society, net social benefits determined according to the prevailing political system. Whatever the market, there is a set of principles which explains the economic decisions of people and the consequent allocation of resources to their current and future uses.

Under an economic system where the institution of private property is dominant, the owners of property objects, such as land, or individual laborers sell their products, or services, for money and with this money buy back products to be consumed. The organization can be classified into two interacting systems of markets and prices. The first is that for the resources of production in which individuals are sellers and enterprises are the buyers; the second is that for the finished goods and services in which the enterprises are the sellers and the individuals the buyers as consumers. These interrelated markets establish the costs and incomes in the first case and the values and satisfactions in the second case. An example is the simple case of a woodcutter who sells his services to a lumber firm for $1000. His income for that period is thereby determined at $1000 and that much has been added to the costs of the lumber which he cut. At the same time, the woodcutter enters the market for finished lumber for his house and uses a part of his $1000 to buy from the lumber concern a house which he will use as a residence for himself and his family. The price he pays for the lumber is related to the wages he received from the sale of his labor to the concern. In just such a way all markets and all prices are related to one another.

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[1] *Economics* means, strictly, proportioning (economizing) to get maximum output with least sacrifice of input factors. The word "economics" is derived from the Greek *oikonomike,* denoting management of the household, *oikos.* In earlier times, the household was the individual producing unit, but as production shifted to the factory, the term "economics" became applied as well to the management of the industrial unit or factory. The concept of management implies proportioning or combining the various factors involved in production and living so as to get the maximum product with a given expenditure of human effort. "Economics is essentially a study of the interrelation of parts, and unless it leads towards the formation of better combinations, it is a dead and useless science." (George M. Peterson, *Diminishing Returns and Planned Economy,* Ronald Press, 1937, p. 103.)

The Principle of Maximization. Direction is given to the allocation of resources and the general production-consumption process through the operation of the principle that *all persons and enterprises tend to maximize their value returns.* The validity of this principle is based on the assumption that economic behavior is rational in the sense that people are motivated by a desire to make the most of the resources at their command. Experience leads us to believe that people act in a manner approaching rational behavior and that their actions are not purely haphazard but reflect an attempt to maximize some particular end.

One of the best examples of the practical application of the principle of maximization is the construction of rail fences from excellent saw-lumber material, in the pioneer days of the midwestern United States. Large amounts of good timber were readily available—in fact, the forests were a hindrance to agriculture and the settler had practically no capital or funds with which to buy wire, nails, or other manufactured products for making fences. He did, however, have time to split rails and construct fences. Consequently, timber that would later have had great economic value as lumber was used to build fences to enclose the settler's stock, because this was the cheapest means available for fencing. Looking backward, this process appears to have been very wasteful, but to the settler, it was the most efficient means of utilizing resources and labor to produce goods he needed in order to survive. In a crude way, he was applying the same principle of maximization which is applied effectively in modern production. The increasing use of farm machinery as wage levels rise reflects the same principle—namely, that the factors of production will be utilized in such proportions that value returns will be maximized.

The practical application of the principle of maximization may also be illustrated by agricultural production in old, densely populated nations and in relatively new, sparsely settled ones. In a country where there is a large supply of labor and a large amount of capital accumulated through generations of saving and thrift, only a very limited amount of land is available for agricultural use. Agricultural production will be characterized by rather *intensive* utilization practices—that is, much labor and capital will be applied to an acre of land, and acre yields will be comparatively large. In contrast, labor is comparatively scarce in a new, sparsely settled area of rich, abundant agricultural lands, but capital is even more scarce, with the result that very few units of capital and labor will be applied to a given area of land, and utilization will be *extensive*. In other words, large amounts of land will be utilized in an extensive way, with only small doses of capital and labor per acre. In such areas, the acreage operated by a given individual tends to be several times greater than that operated in an older country.

The Equi-Marginal Principle. Maximization is accomplished through operation of the *equi-marginal principle,* which may be stated in the following terms: *Assuming effective competition, the division of a fixed quantity of anything among a number of different uses will be made so as to apportion to each use an amount just sufficient so that the increment of gain in one use will be the same as in every other use to which it might be put.* Transfer of resources from one use to another will occur until the rate of gain from transference just equals the rate of loss from withdrawal. A consumer, for instance, will transfer his expenditure of income from food to clothing at the point where additional units of clothing will yield satisfaction equal to what would have been gained from additional units of food. If additional food would have yielded greater satisfaction than the additional clothing, then the transfer would not be made.

The Principle of Diminishing Marginal Rate of Substitution. It is characteristic of consumption and production that as more and more of all goods or services are consumed or produced, the increment of satisfaction or value return diminishes. The same may be said when two goods are substituted for one another. It can be said that, in general, smaller and smaller increments in quantities of a good foregone are necessary to compensate for the substitution of another good. This, in its simplest form, is the *principle of diminishing marginal rate of substitution.* A consumer will tend to value pork less and less in terms of beef as he substitutes the first for the second. The same applies to an enterprise when machines are substituted for men. The operation of this principle is a condition necessary to *equilibrium* for the individual and also for the economy as a whole.

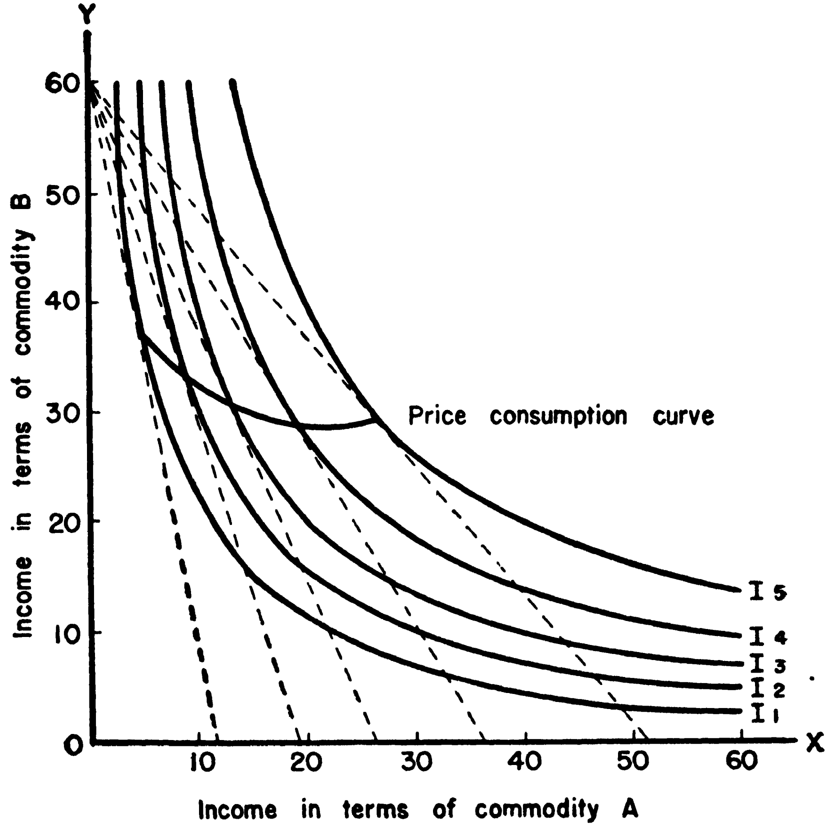

FIGURE 10. Indifference Curves for Commodities *A* and *B*.

If a diminishing marginal rate of substitution associated with diminishing utility did not apply, once a consumer began to purchase pork he would not stop purchasing it until his whole income had been used for that purpose.

The Theory of Demand. Since land use is so profoundly affected by consumer choices among the final products of land, some discussion of the theory of demand is necessary to explain the behavior of consumers.

A basic assumption in the theory of demand is that the consumer can, by substituting one commodity for another, find several equally satisfactory commodity combinations. For instance, a consumer might be perfectly indifferent about a choice between six pounds of beef combined with eight pounds of pork and five pounds of beef combined with nine pounds of pork for his family's weekly meat consumption. According to the principle of maximization either combination would be more satisfactory than a combination of five pounds of beef and eight pounds of pork. In Figure 10, indifference curve I_3 shows that the consumer will be equally satisfied with 50 units of commodity *B* and 7 of commodity *A*, 20 units of commodity *B* and 20 units of commodity *A*, or any other combination of *A* and *B* which occurs on I_3. The indifference curve merely expresses the consumer's scale of preference, and has nothing to do with his income or with the prices of commodities *A* and *B*. The convexity of the indifference curves to the origin is an expression of the diminishing marginal rate of substitution.

People tend to divide their time between leisure and earning work according to the equi-marginal principle. Hours will be spent at work until the marginal rate of gain from earnings just equals the marginal rate of loss from leisure foregone. Allocation of a fixed quantity of time to leisure and earning work follows, in general, the principle of diminishing marginal rate of substitution. Within the relevant range near to the time-budget equilibrium, indifference curves could be drawn to express the relationship between the hours spent in a particular rate of pay.

The choice between present and future consumption can be plotted on an indifference map of an individual scale of preferences. The choices between present and future consumption of products, and therefore of resources, is of major importance in the study of land economics, especially in the analysis of conservation problems. It is possible for a consumer to change his scale of consumption in any particular budget period by saving part of his income for future consumption, or borrowing against future income for consumption in that budget period. The choice of scale of consumption, in any budget period, depends upon the size of expected future income, its degree of uncertainty, the degree of impatience of the individual, and the rate of interest.

The slopes of the indifference curves in Figure 11 express the marginal rate of substitution between expenditures in the present and in the future. If the individual has no time preference, or "impatience," the indifference curves will be symmetrical about the line *OR*, and will cut this line at an angle of 45°. If time preference is present, however, as it usually is, the indifference curves will cut *OR* at an angle greater than 45°. Equilibrium of the individual's

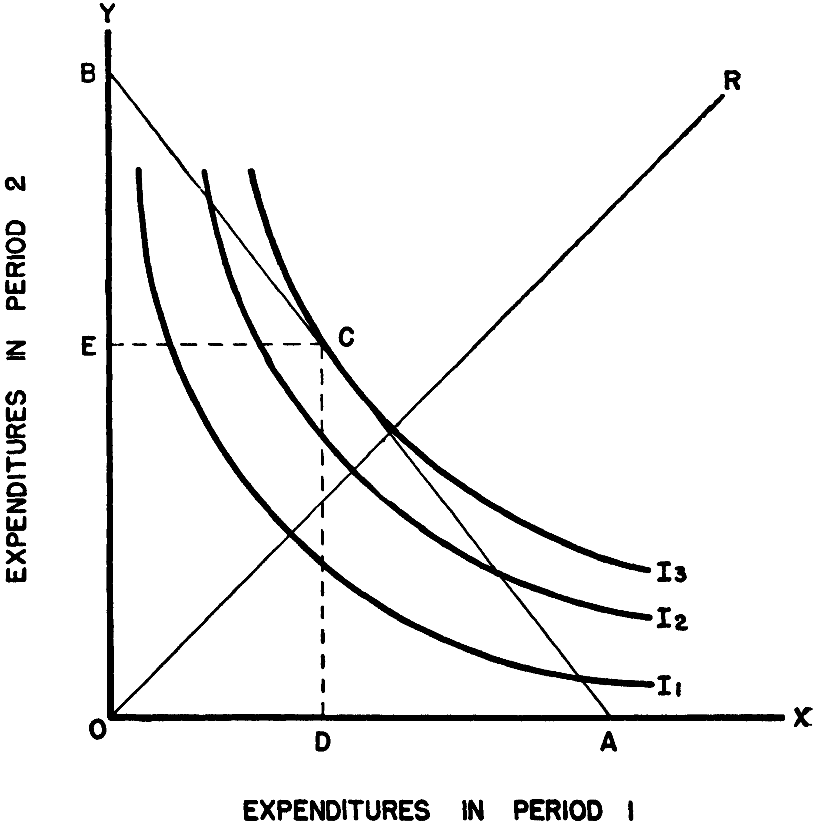

Figure 11. Indifference Curves of Expenditures in Period 1 and Period 2.

time-period expenditures can be determined from the diagram, if income for the two periods is known and the rate of interest is given. It must be assumed that the individual starts the first period and ends the second with no funds, and that he can save or borrow unlimited amounts at the going rate of interest. A line *AB* can be drawn, to represent his opportunity for expenditures, by measuring expenditure possibilities in period 1 on the *X* axis, and in period 2 on the *Y* axis. If *R* is the rate of interest, the slope of this line will be 1 plus *R*. Where this line is tangent to the highest indifference curve (I_3 at C) the rate of interest will be equal to the rate of impatience, and the individual will spend *OD* in period 1 and *OE* in period 2. In this way it is possible to discover the expenditures which people will make in different time periods as the rate of interest changes. This is an important aspect of the determination of conservation rates.

The rational consumer will maximize his satisfaction from a given income by attempting to find that combination of commodities which will give him the largest amount of total utility at any particular ratio of prices. He will obtain maximum utility, or find the highest indifference curve, when the price ratio is equal to the marginal rate of substitution. If the marginal rate of substitution is not equal to the price ratio, the consumer will gain by substituting one commodity for the other until the two ratios are equivalent.

The price consumption curve can be interpreted in terms of the usual Marshallian demand curves by assuming that the price of all other goods but *A* remains constant, and by substituting general purchasing power for commodity *B* on the *Y* axis. The result would represent *A's* rate of substitution for all other goods, including the present value of those to be bought in the future; the price consumption curve becomes the regular price demand curve, with quantity on the *X* axis and price on the *Y* axis. The elasticity of this curve is the measure of the proportionate change in quantity accompanying a small change in price.

By summing all of the *X* ordinates of individual demand curves in the market, an aggregate demand curve can be obtained for any commodity. In pure competition, this aggregate demand curve represents that of the industry. Any single firm of the industry will face a perfectly elastic demand curve since, by definition, no single firm can have a perceptible influence on price under *pure competition.* Under conditions of *monopoly* or *monopolistic competition,* on the other hand, nothing is gained by attempting to derive an aggregate demand curve for the industry; for each firm has, by definition, a differentiated product for which rival products are not perfect substitutes. The demand curve facing such firms will be less than perfectly elastic, and therefore negatively sloping. In *oligopoly*—where several firms produce a similar product—the demand curve facing each individual firm depends upon the actions or reactions of each of the other firms. For that reason, only the individual demand curves facing these firms are relevant to most economic analyses.

Analogous to consumer choices among alternative goods for the satisfaction of their desires are the choices of firms among alternative agents of production to obtain maximum profit. There is also a

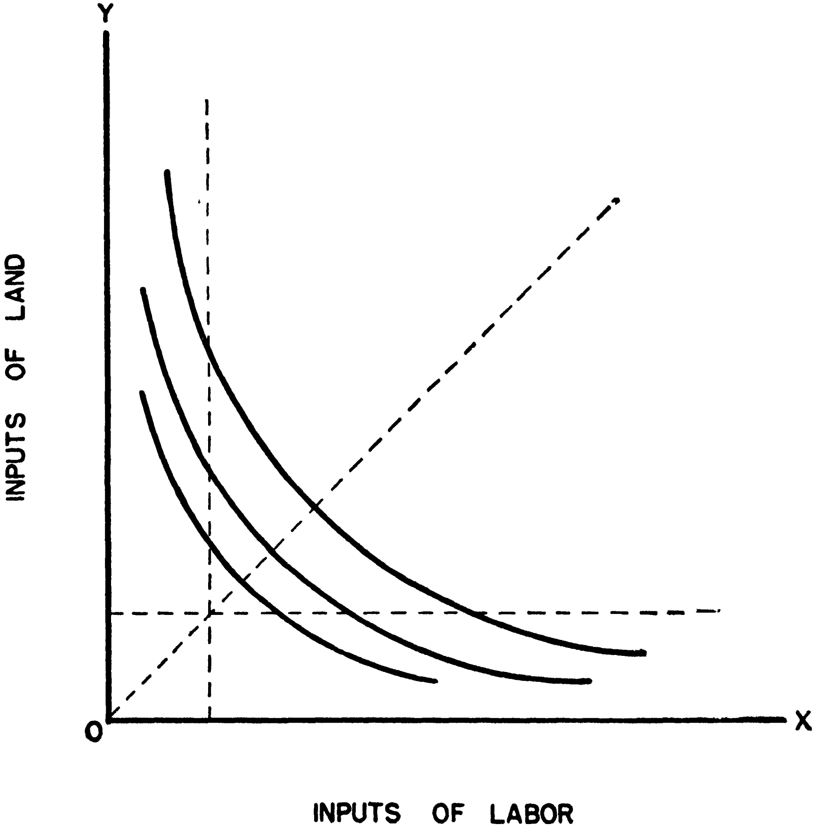

FIGURE 12. Diagram of Isoquants (Equal Output Contours).

similar analogy of the choices of agents among alternative opportunities in different firms or industries to obtain maximum net earnings. According to the equi-marginal principle, firms will substitute resources in the production process until the marginal rate of substitution between the agent is equal to the ratio of the prices of the agent. This can be shown most readily by reference to a diagram of isoquants or output contours for varying combinations of agents. In Figure 12, each isoquant represents an equal quantity of output with varying combinations of labor and land, which are represented on the X and Y axes respectively. The shape and position of the isoquants are determined by two important characteristics of the relation of output to input. First, any line drawn from the origin will be cut in equal segments by successive isoquants if there are constant returns to scale. (Constant returns to scale is illustrated by the doubling of both factors, say land and capital, resulting in a doubling of the total output.) If increasing returns to scale prevail, the line through the origin will be cut by successive isoquants in smaller and smaller segments and conversely with decreasing returns. These become significant considerations, especially when a firm is deciding the size of plant to be established. The second important characteristic determining the shape and position of the isoquant is the rate of substitution between land and labor. If lines are drawn parallel to the axes and are cut in larger and larger segments by successive isoquants, the well-known principle of diminishing returns is effective. A parallel line to the X axis represents the situation in which land is held constant and labor is increased. If the principle of diminishing returns is effective, equal increments in output can only result from successively increasing quantities of labor.

The curvature of the isoquant measures the rate of substitution between the agents. Straight lines would indicate perfect substitution; convexity toward the origin indicates the usual case of diminishing marginal rate of substitution; i.e., it takes less and less of the decreasing factor to equal the output due to the increasing factor. If the isoquant forms intersecting vertical and horizontal lines, the agents cannot be substituted for each other but must be used in fixed rates.

The Principle of Diminishing Marginal Productivity. When Malthus argued that population tended to outrun food supply, he was stating a principle which has become known as the *Principle of Diminishing Physical Returns.* Malthus indicated that the land could not produce food as fast as population could expand. Experience proves it is impossible to add labor, capital, and management to a given piece of land and secure the same proportionate rate of return or increased output indefinitely.

The principle of diminishing marginal productivity applies to each factor of production and determines, in a physical sense, maximum output in units secured from a given combination of productive factors. The economic combination is basically determined by the physical relationships of the factors. This principle may be stated as follows: If, with productive methods continuing unchanged, successive physical units of one productive factor are added to a fixed physical quantity of another factor (or a constant combination of other factors) the *total physical output* obtained will vary in amount through three distinct phases. (1) It will *increase,* for a time at an increasing absolute rate and then at a decreasing absolute rate, but always at a percentage rate greater than the rate of increase of the variable factor, until finally a point is reached at which the rate of increase of output will exactly equal the rate of increase of inputs of the variable factor; (2) the total physical output will continue to increase, but at a decreasing absolute rate and at a percentage rate always less than that of the variable factor, until a point is reached where maximum output is secured; and (3) total physical output will *decrease,* possibly at an increasing absolute rate for a time, but probably at a decreasing rate through most of this phase, until finally a point is reached at which output is reduced to zero.[2] The principle may also be stated in terms of diminishing *marginal* or additional returns (*M*) obtained from the variable factor, diminishing *average* returns (A), and diminishing *total* returns (T).[3]

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[2] This statement of the principle has been adapted from John M. Cassels, "On the Law of Variable Proportions," in *Explorations in Economics: Notes and Essays Contributed in Honor of F. W. Taussig,* McGraw-Hill, 1936, Part II, chap. II, pp. 223–236. Cassels points out the more important shortcomings of some common ways of expressing the principle, such as "In a given state of the arts, after a certain point is reached, the application of further units of any variable factor to another fixed factor (or fixed combination of factors) will yield less than proportionate returns." (See also F. H. Knight, *Risk, Uncertainty, and Profit.* Houghton Mifflin, 1921, pp. 97–103; J. D. Black and A. G. Black, *Production Organization,* Holt, 1929, chaps. V–XI, inclusive; and Peterson, *op. cit.,* chaps. I and II.)

These three phases of the principle of diminishing productivity can be illustrated by a typical farm operation. Let us assume that we have a field of potatoes and two modern potato-diggers, and that we wish to find the best number of men to employ with these machines. If we begin with one man and add one at a time, the results might be like those indicated in Table 2, in which the point between which the eleventh and twelfth man is added gives the greatest output per man. This point would be called the point of maximum efficiency of labor, assuming the number of machines remains fixed at two. Regardless of the wage scale, this point will represent the lowest labor cost per unit of output, if wages are the same for each man hired.

Although output per man falls steadily after the addition of the twelfth man, the output per machine continues up to the point at which the sixteenth man is added. This point is the point of maximum efficiency of machines. As long as the number of machines is limited to two, this point is the point of lowest machine cost per unit of output.

The data in Table 2 illustrate the three phases. It can be seen from these data that in the third or last phase, the amount of the variable factor in relation to the fixed factor is so great as to be actually harmful, while in the first phase the fixed factor is so excessive in relation to the variable factor that it has the effect of reducing output. In either of these two phases greater output could be secured by eliminating enough of the excessive factor to bring the two into a relationship more like that attained in the second phase.

The preceding behavior of diminishing physical productivity is common, in general, to all production activities involving the combination of two or more factors of production, although the exact character of productivity phases varies greatly with different combinations. The student should remember, however, that the principle of diminishing productivity is purely physical, as well as

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[3] Black and Black, *op. cit.*, chap. V. Cassels points out that when the law is stated in these terms alone, it is difficult to distinguish clearly the three important phases, whereas when they are used together the end of the first phase is the point where average outputs attain their maximum, and the end of the second is the point where the marginal outputs become zero. (See Cassels, *op. cit.*, p. 227.)

Table 2. Hypothetical Inputs of Machines and Labor on a Given Unit of Land and Outputs of Potatoes, Illustrating the Principle of Diminishing Physical Productivity

Inputs				Daily Output of Potatoes in Bu.	Marginal Physical Product per Man per Day	Daily Output per Machine	Output per Man Day	
Machines	Per Cent Increase	Man Days	Per Cent Increase					
2	–	1		35	35	17.5	35	[a]
2	100	2	157.1	90	35	45.0	45	
2	50	3	66.7	150	60	75.0	50	
2	33.3	4	60	240	90	120.0	60	
2	25	5	45.8	350	110	175.0	70	
2	20	6	45.7	510	160	255.0	85	
2	16.7	7	27.6	651	141	325.5	93	
2	14.3	8	20.4	784	133	392.0	98	
2	12.5	9	17.1	918	134	459.0	102	
2	11.1	10	14.4	1050	132	525.0	105	
2	10	11	11.0	1166	116	583.0	106	
2	9.1	12	9.1	1272	106	636.0	106	[b]
2	8.3	13	7.3	1365	93	682.5	105	
2	7.7	14	5.6	1442	77	721.0	103	
2	7.1	15	3.0	1485	43	742.5	99	
2	6.7	16	1.3	1504	19	752.0	94	
2	6.3	17	–0.5	1496	– 8	748.0	88	[c]
2	5.9	18	–7.0	1392	–104	696.0	87	

[a] Range of increasing proportional output per man.
[b] Range of decreasing proportional output per man.
[c] Absolute decline of output.

strictly static, and is applicable only on the assumption that the factors (or at least the variable factor) can be broken up into small separable homogeneous units. This is obviously an abstraction, but it is considered useful in the economic analysis of land utilization problems if its limitations and assumptions are kept in mind. The fact that most production involves combining several productive agents (for instance, barley production may use land, labor, fertilizer, horses, machines, seed, and other productive agents) and that factors of production cannot ordinarily all be divided into minute, separable, homogeneous units, means that the effects of these practical situations must be analyzed carefully in applying the basic concepts of the principle of diminishing productivity to land utilization problems.

The Principles of Specialization and Comparative Advantage. One of the entrepreneur's most important problems in utilizing land resources is what things to produce and what to buy. We know that in actual practice some entrepreneurs specialize in certain products, and that certain areas specialize in certain products, while other entrepreneurs and other areas produce others. What determines products produced by individual entrepreneurs or in certain areas or locations? Why does the entrepreneur produce a limited number of products instead of all those he needs or desires? The answers to these questions are found in two principles—one, the *Principle of Specialization;* the other, the *Principle of Comparative Advantage.*

The principle of specialization, applied to persons, is that *each person tends to work at only one task and to sell the product thereof and with the proceeds buy the other things desired or needed.* Applied to areas or locations, the principle of specialization is that *each area or location tends to produce only a few things and to sell its surplus of these and with the proceeds buy the other things desired or needed.* Determination of products specialized in is based upon the principle of comparative advantage or comparative cost. Comparative advantage and comparative cost are reciprocals, because the greater the advantage, the lower the cost, and the lower the advantage, the higher the cost. Consequently, "comparative advantage" and "comparative cost" can be used interchangeably.

A few illustrations will indicate more clearly the meaning and significance of the Principle of Specialization and the Principle of Comparative Advantage. Let us assume that two farmers, Brown and Jones, can grow all the food they need and make all the clothes they need, and that their net outputs per unit of effort at these two occupations, or what might be termed the marginal productivities of their labor, are as follows:

Occupation	*Brown*	*Jones*
Clothes	20	20
Food	10	10

Under these circumstances, there will be no specialization, and no trade or exchange of goods between Brown and Jones. One unit of food will be worth exactly two times a unit of clothes to both operators. In other words, there would be no advantage to Brown or Jones in specializing on clothes or food, since their ratio of advantage between clothes and food is the same.

Let us assume that the net outputs per unit of effort, per marginal productivity of labor, at the two occupations for the two operators are as follows:

Occupation	*Brown*	*Jones*
Clothes	35	28
Food	15	12

It can be seen that even though Brown's net output for both clothes and food is considerably larger than Jones', the ratio between their two outputs is 7 to 3. Three units of food are worth 7 units of clothes to both operators. Consequently, neither has a ratio of advantage in the production of food or clothes, and specialization on either product would be advantageous to neither.

The following illustration indicates a situation in which specialization would occur, and where exchange of products between Brown and Jones could be made to advantage:

Occupation	*Brown*	*Jones*
Clothes	20	10
Food	10	20

Under these circumstances, a unit of food will be worth two units of clothes to Brown, but only half a unit to Jones. If Brown specialized in producing clothes, his net output would be 40 units of clothes, and if Jones specialized in growing food, his total output would be 40 units of food. Thus, the combined production of the two operators, by specialization, would be 40 units of clothes and 40 units of food, whereas if neither specialized on clothes or food, Brown's total production would be 20 units of clothes and 10 of food, and Jones' total production 10 units of clothes and 20 of food —a total of 30 units of clothes and 30 of food. By specializing, 10 additional units of both clothes and food are produced, and if the two trade with each other in terms of one unit of clothes for one unit of food, Brown can have a total of 25 units of clothes and 15 of food, and Jones can have 15 units of clothes and 25 of food, where previously Brown had 20 units of clothes and 10 of food and Jones 10 units of clothes and 20 of food. Thus, by specializing and trading surpluses derived from specialization, each gets 5 more units of clothes and 5 more units of food than he would have without specialization.

It will be noted that Brown has a higher ratio of advantage in making clothes, and Jones a higher ratio of advantage in producing food. Brown's ratio of advantage in making clothes, compared with growing food, is 2 to 1, but the corresponding ratio for Jones is 1 to 2. Consequently, Brown will make the clothes and Jones will produce the food. The principle of comparative advantage is illustrated, since a product tends to be produced by those persons whose ratio of advantage in the production of it is higher.

No attempt will be made here to go into the complex relationships which result when numerous persons and products are considered. The basic principle applies in these more complex cases; moreover, the same principle applies to regions or locations. If, in the preceding illustrations, region *A* and region *B*, or country *A* and country *B*, are substituted for Brown and Jones, the application of the principle of comparative advantage would be the same. There is, however, a situation not illustrated in the above examples, which frequently occurs in actual practice—the case where one person or region or country is superior to another, or to all others, in the production of both or most products, but not superior in the same ratio. Let us assume that country *A* and country *B* have the following net outputs per unit of effort for the two products, steel and cotton:

Product	*Country A*	*Country B*
Steel	36	12
Cotton	24	6

In this case, country *A* is three times as productive as country *B* in making steel and four times as productive in producing cotton. In country *A*, 24 bales of cotton are equal in value to 36 tons of steel, or 1 bale of cotton is equal in value to 1½ tons of steel. In country *B*, 6 bales of cotton have the same value as 12 tons of steel, or 1 bale of cotton is equal in value to 2 tons of steel. Since *A* has a higher ratio of advantage over *B* in the production of cotton (4 to 1) than it has in the production of steel (3 to 1), country *A* will tend to specialize in cotton, in which its advantage is greatest, and *B* to specialize in steel, in which its disadvantage is least. Consequently, we can modify our statement of the principle of comparative advantage by saying that *a nation will tend to specialize in producing those products in which it has the highest comparative advantage or the least comparative disadvantage.* The same principle applies to individual persons.

The Principle of First Choice. When comparative advantage is measured in ratios of net outputs, as indicated above, demand produces its effect directly by determining selling prices of the various products. Where there are abundant resources of a product, or of persons well qualified to make it, in proportion to the demand, the product sells at a relatively low price and will tend to reduce output produced more in line with the output of less favored commodities. For example, copper may sell at such a low price that only the richest or most efficiently worked deposits may be used, whereas almost any gold deposit of any significance is likely to be worked. This leads to another statement of the principle of comparative advantage, commonly referred to as the principle of first choice, really a corollary of the first. The principle of first choice states that any occupation for which only a limited number of persons are qualified, in proportion to the need for it, will be first choice of these persons. The same principle can be stated in terms of regions or locations. For example, in the matter of factory locations, there is a limited number of areas in which the basic raw materials—such as coal and iron supply, in the case of steel-making—are close to each other; and consequently any location of this kind is likely to be used for steel manufacturing. Areas close to railway and water-terminal facilities and also to the main retailing district are limited in most cities, with the result that such areas are almost certain to be used for wholesaling, coal storage, and related operations. Any land well suited to production of cotton or corn will probably be used for this purpose, because these crops have very specific climatic requirements, and considerable amounts of cotton and corn are consumed. There is, on the other hand, an abundance of land well suited to the cultivation of wheat relative to the demand for it.

The more limited a region or country is with respect to its people and the diversity of its natural resources, the more specialized it will be. A region will be more highly specialized while it is undeveloped than after it becomes more densely populated and has been settled for a considerable period. In new countries, people naturally undertake those occupations and industries that produce the greatest net return, and less advantageous industries are developed gradually. Obviously a nation or region will not undertake the production of a good if any unit of labor cannot produce enough of this good to yield a return equal to the marginal value product of labor employed in producing an alternative commodity. In some areas, even under the most favorable circumstances, the marginal productivity of labor in production of a given commodity *C* is not sufficient to equal the value product of the marginal labor employed in production of commodity *B*, in which case commodity *C* will not be produced. However, if it is assumed that population increases in all regions, the margin of production is pushed down further in each region, and marginal productivity may be so reduced that while it was uneconomical to produce commodity *C* before, it is now possible to do so because of the fact that the margin of productivity in commodity *B* has so declined as to make the value product of the marginal labor employed in producing commodity *B* as low as that of the marginal labor employed in producing commodity *C*. Thus, with the increase in population, marginal productivity may be reduced to such an extent that each region would be producing two commodities instead of one, but would still specialize largely in the commodity in which it has the greatest advantage.

Some popular interpretations of the principle of comparative advantage include the rule of buying anything which can be bought more cheaply than it can be produced, and hiring those things done which you can hire more cheaply than you can do them yourself. If a manufacturer is trying to decide whether to buy power or produce it, he decides the question on the basis of which costs less. If others can produce power more cheaply, he should buy power from them and concentrate on manufacturing products in which he has a greater relative advantage or less comparative disadvantage than in the production of power. A country would import any supplies or products which it could buy more cheaply than it could produce. However, in determining what a product costs to produce, it is important that all costs be included and weighted properly. Too frequently, accurate comparative measures of the costs of producing the product at home and abroad are not available. For instance, the United States has in the past exported millions of bales of cotton, and it has been generally assumed that this country had a comparative advantage in the production of this crop. When allowance is made for such social costs as soil exhaustion and soil erosion, our real costs of production per bale of cotton may be considerably different from those usually given in strict, immediate monetary terms. Wheat furnishes an example which is quite similar, because to the usual cash costs of operation should be added costs for feed and seed loans, soil conservation, protection against grasshoppers, relief of distressed farm families, and other social costs necessarily encountered in many wheat-producing areas. Similarly, if a nation exploits its people or soil in order to trade certain products to other nations, it may appear at first glance to have a comparative advantage in such production while in the long run no such comparative advantage actually exists. However, adequate and accurate cost accounting, including social costs involved, should make it possible to determine the comparative cost of producing certain goods in different areas or different countries.

Production in true accordance with the principle of comparative advantage is economical—that is, it is being done with the lowest possible expenditure of human effort and natural resources. When it is not so done, human or natural resources are wasted. Using a piece of land in production for which it is not well adapted is wasting natural resources; and giving a man a job which many others may be able to do as well, when he is badly needed for a task which is short of men, is wasting human resources. Consequently, public policy should concern itself primarily with securing the freest possible working out of the principle of comparative advantage. Too often in the past it has not done this, and obstacles like the tariff have been placed in the way of the freest possible operation of the principle.

Such obstacles have often been adopted because one nation or area fears competition from another. However, it should be clearly understood that even though a nation or area is inferior in many or even all types of production, it may still be able to supply its domestic market and even sell certain commodities to another nation or area. Inferiority in natural resources will mean that the wage level will be low, but this does not mean that capital and labor will not be employed. Nations with superior natural advantages will not be able to undersell an inferior nation in all lines, because in the superior nations employers will have to pay higher wages, with the result that wage levels in those areas may be so high that the inferior area or nation, with its relatively lower wage levels, can compete in many lines. At the same time, high-wage areas or nations need not fear that low-wage areas or nations will be able to undersell them in all lines of endeavor, for such countries enjoy high wage levels because of superiority in production or higher marginal productivity. Thus, the cost of labor in such superior areas is no higher than that in low-wage areas, on a marginal productivity unit basis. It is not *wages* which determine comparative costs, but relative labor *costs.* If in some cases low-wage countries do undersell high-wage areas, the superior areas would inevitably have to readjust wage levels. However, the fact that many modern nations have been able to continue high wage scales is proof that their marginal productivity is superior to that of some other areas where lower wage levels prevail.

The Highest-Return or Best Combination of the Factors. The user of land is interested in making the greatest possible net return, or least net loss from his operations. The point at which the product can be produced for the lowest total cost per unit is not necessarily the same point at which the operator can make the highest net profit. Let us assume that an entrepreneur is manufacturing shoes, and has the cost conditions indicated in Table 3. If the market for shoes is a purely competitive one, demand for the shoes made in this factory will be perfectly elastic, while marginal revenue and average revenue will coincide. That is, the number of pairs of shoes the manufacturer produces and can sell may vary anywhere from zero to the greatest possible output without causing the price of shoes to change. Thus, for each additional pair of shoes the operator would receive the same price, and total revenue would always increase by the price received for the additional unit. In other words, marginal revenue is equal to price.[4]

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[4] The term "revenue" is more appropriate to use than "value," because the income of any factor tends to equal its marginal contribution to the *revenue* (or perhaps we could call it "profits") of the firm employing it. Use of the term "value" might be more readily interpreted as implying some contribution to a total outside the firm, which is of social, as compared with individual significance—such, for example, as the total product or value of the product available to the economic community. For a more detailed analysis of these points, see E. H. Chamberlin, "Monopolistic Competition and the Productivity Theory of Distribution," *Explorations in Economics,* McGraw-Hill, 1936, pp. 248–249.

TABLE 3. Hypothetical Unit Cost Schedule of a Shoe Factory

Output in Hundreds of Pairs of Shoes	Total Fixed Costs	Average Fixed Costs per Pair of Shoes	Total Variable Costs	Average Variable Costs per Pair of Shoes	Total of All Costs	Average Total Unit Cost (per Pair)	Marginal Cost (per Pair)
1	$1000	$10.00	$ 850	$8.50	$ 1,850	$18.50	$ . . . .
2	1000	5.00	1,380	6.90	2,380	11.90	5.30
3	1000	3.34	1,890	6.30	2,890	9.63	5.10
4	1000	2.50	2,380	5.95	3,380	8.45	4.90
5	1000	2.00	2,845	5.69	3,845	7.69	4.65
6	1000	1.66	3,285	5.49	4,285	7.14	4.40
7	1000	1.43	3,695	5.28	4,695	6.71	4.10
8	1000	1.25	4,075	5.09	5,075	6.34	3.80
9	1000	1.11	4,435	4.93	5,435	6.04	3.60
10	1000	1.00	4,755	4.76	5,755	5.76	3.20
11	1000	.91	5,060	4.51	6,060	5.51	3.05
12	1000	.87	5,345	4.45	6,345	5.29	2.85
13	1000	.77	5,595	4.30	6,595	5.07	2.50
14	1000	.71	5,875	4.19	6,875	4.91	2.80
15	1000	.67	6,195	4.13	7,195	4.79	3.20
16	1000	.63	6,620	4.14	7,620	4.76	4.25
17	1000	.59	7,220	4.25	8,220	4.84	6.00
18	1000	.56	8,340	4.63	9,340	5.19	11.20
19	1000	.53	10,870	5.72	11,870	6.24	25.30
20	1000	.50	14,635	7.32	15,635	7.82	37.65

The above situation is true only under pure competition, where both average costs and average revenue (price) remain constant when a small proportionate change in all the factors together yields a proportionate change in product. Under pure competition, the factors are paid according to the value of their marginal product; but there is no tendency whatever for factors to be paid in this way when monopoly elements are present. The productivity of any factor must be considered as the total product it creates, less that which its presence prevents others from creating; and under monopolistic conditions, the effect upon price of the increased output must be accounted for, because by definition of monopoly, the monopolistic firm's production will influence the price.[5]

It should be realized in the beginning that unless price is at least equal to average variable costs at some level of production, no production will take place under pure competition unless the entrepreneur desires to keep a force of key workers intact or feels that there is a prospect of higher prices or lower costs in the future. With the data in Table 3, if market price were $2.50 and 13 units were produced, total costs would be $6595 and total revenue $3250 ($2.50 × 1300 pairs of shoes), leaving a net loss of $3345. At this point, net loss is the least possible with any combination of the factors. Consequently, the operator could not continue unless price rose at least to the level of average variable costs, since it would be more expensive for him to operate the plant under these conditions than to allow it to remain idle, thereby losing only the fixed costs (amounting to $1000 per day), or considerably less than the loss indicated above.

If we assume a price of $4.25, what would be the best combination of productive factors in this factory? The principle to keep in mind here is that at any price above minimum average variable cost, the output at which marginal revenue is equal to marginal cost will be the point of least net loss. In Table 3, column 8, a marginal cost of $4.25 occurs with an output of 1600 pairs of shoes. At this output, revenue would be $6800 ($4.25 × 1600 pairs), while cost of producing this volume would be $7620, leaving a net loss of $820. This is the point of least loss, if the price is $4.25, but the operator would be better off to produce these 1600 units at this price than to shut down the plant, if we assume that he could save none of his fixed costs by shutting down completely. In other words, the price of $4.25 covers the variable costs and leaves $180 to meet part of the fixed costs of $1000. The operator could not continue to produce shoes, in the long run, at this price of $4.25, because eventually his plant and machinery would wear out and have to be replaced. They would not be replaced unless prospective prices were sufficiently high to cover costs of constructing the plant and yield a normal rate of return on the investment. Ultimately, therefore, at the price of $4.25 the operator would be forced out of business, so that $4.25 would not be a long-run equilibrium price.

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[5] For more detailed treatment of the determination of equilibrium price and the combination of the factors of production under pure competition and imperfect competition or monopoly, see A. L. Meyers, *Elements of Modern Economics*, rev. ed., Prentice-Hall, 1941, pp. 136–174; Chamberlin, *op. cit.*, pp. 237–248; Joan Robinson, *Economics of Imperfect Competition*, Macmillan, London, 1933; K. E. Boulding, *Economic Analysis*, Harper, 1941, pp. 455–478; and F. B. Garver, and A. H. Hansen, *Principles of Economics*, Ginn, rev. ed., 1937, pp. 61–76.

Let us assume a price for shoes of $6 per pair with the production cost data in Table 3. The guiding principle in this case is that at any price above average total unit costs, the output at which marginal revenue is equal to marginal cost will be the point of maximum net profit. At any output less than this point, addition to total revenue (marginal revenue) from a larger output would be greater than the addition to total cost (marginal cost) occasioned by a larger output. In other words, net profits could be increased if the operator carried his inputs in terms of costs to the point where the last addition contributed an increase in output just sufficient to cover its cost at the going market price. At any point short of this combination, the operator will lose money, because as long as there is even as much as one cent net return over and above the cost of the last increment, his net profit will be increased by the addition; whereas, if he continues beyond the point where the last increment just pays its cost, his net profit will be reduced because each additional input costs more than it contributes to the net return. Reading down column 8 in Table 3, it will be seen that a marginal revenue of $6 (a price of $6 per pair of shoes) will just equal marginal cost at the output of 1700 pairs of shoes. At this output, revenue is $10,200, and cost is $8220, leaving a net profit of $1980. This is true in spite of the fact that the price of $6 per pair would still be above cost (average total unit cost) for an output of 1800 pairs. At this latter output (1800 pairs) revenue with a price of $6 per pair would be $10,800, but costs would amount to $9340, or a "net profit" of only $1460, or $520 less than with production of 1700 pairs.

Equilibrium of the Firm. Following the equi-marginal principle, individual firms will reach equilibrium when marginal costs are equal to marginal revenue; i.e., the point where the difference between total cost and total revenue will be at a maximum. The individual firm would be in equilibrium, under the preceding assumptions, with an output of 1700 pairs of shoes, assuming that no plant of any other size would have lower costs. However, $6 would not be an equilibrium price for the industry if perfect competition existed, because any new firm which encountered the same cost conditions would be able to make $1980 net profit, and the industry would probably attract new competitors. Increased output would, in the long run, probably force down the market price because of greatly increased output; but equilibrium for the industry would be reached at the point where price is equal to minimum average total unit cost of each firm, assuming that no production factors are scarce in the industry or firm, and that all firms have the same cost conditions. Any price higher than this would tend to encourage new firms to enter the industry, and a lower price would tend to force some of the operating firms out.[6]

In every industry, some operators are more efficient than others—that is, they can produce a greater output with the same costs or produce the same output at a lower cost than other producers. When an entrepreneur is just able to cover expenses, he is called a marginal entrepreneur, and the unit he operates is said to be a marginal unit. Marginal firms may be expected to expand production under the pressure of competition to the point of lowest total unit cost, and this point tends in competition to become the prevailing price. Superior operators, who for one reason or another can produce with lower costs per unit, can carry operations to a point beyond that of the marginal producer, and still meet their costs. Like the marginal entrepreneur, the superior entrepreneur will continue to employ variable inputs as long as they at least pay for themselves. In other words, the superior entrepreneur operates on exactly the same principle, and will continue to add inputs until marginal cost just equals marginal revenue because at this point he will make his highest possible net profit. The lower costs of the superior entrepreneur may be due to a wide variety of circumstances, but lower costs tend to disappear under the pressure of competitive and price-making forces, and differences in unit costs are due to the failure of production adjustments to meet promptly the changed conditions continually arising in a dynamic society.

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[6] This statement is true, assuming that existing firms in an industry are all of optimum size. If plants are not of optimum size, an addition to plant and equipment might make it possible to increase output at the same variable cost, and with an addition to fixed costs of considerably less than that shown in Table 3. Consequently, it can be said that the equilibrium points for the individual firm hypothetically illustrated in Table 3 are equilibrium points only on the assumption that the firm is already at optimum size. Otherwise, all equilibrium points shown are what the ultimate outputs for the plant at its present size would be at various prices, and they do not take into consideration the fact that it might be possible to secure lower costs with a plant of a different size. (See Meyers, *op. cit.*, p. 144.)

Various stages of imperfect or incomplete competition in various industries influence output and the combination of productive factors used. In imperfectly competitive or monopolistic situations, the owner of the monopolistic firm has the same motives and follows the same general process in seeking the highest-profit combination of factors as does the purely competitive owner. However, under pure competition the marginal revenue product consists of the number of units of product added by the last unit of a factor employed, multiplied by the sale price per unit of the product, because the individual firm accepts the price as a given condition which it cannot change, and hence does not consider changes in its own output as a price-influencing factor. In contrast, under monopolistic conditions the effect of increased output upon price must be accounted for because, by definition of monopoly, the monopolistic firm's output will influence price. The marginal revenue product under these conditions can be computed by the increase in number of units produced by adding an additional unit of input, multiplied by the price of the product, less the loss in revenue on all previous units of output caused by the decrease in price necessary to sell the increased output. Land rent, under certain conditions, and particularly for certain types of land use, is determined under imperfectly competitive conditions. Some of the social implications resulting from this situation are discussed in the next chapter.

Agriculture is almost perfectly competitive and suffers economically in relation to industry which generally is monopolistic and imperfectly competitive. There are more than six million farms in the United States and the individual producer's output is not sufficient to be a price-making factor in the market. In contrast, in many industrial lines a very few firms, sometimes only one or two, produce half or more of the total output. Under these conditions the individual firm has considerable and frequently virtually complete price-making power. When purchasing power and market demand decline appreciably such as during a severe depression, industry reduces production and industrial price levels are maintained or decline relatively little, whereas agriculture maintains production or may even increased total output slightly and prices drop significantly. This is what occurred during the depression thirties as is portrayed in Figure 13. The resulting economic disparity between agriculture and industry brought forth the domestic allotment plan of the Agricultural Adjustment Administration to reduce farm production, and parity prices and related programs to bolster farm income and purchasing power. In addition, numerous federal agencies were established to provide jobs for the millions of unemployed who were without work because of the greatly reduced industrial production.

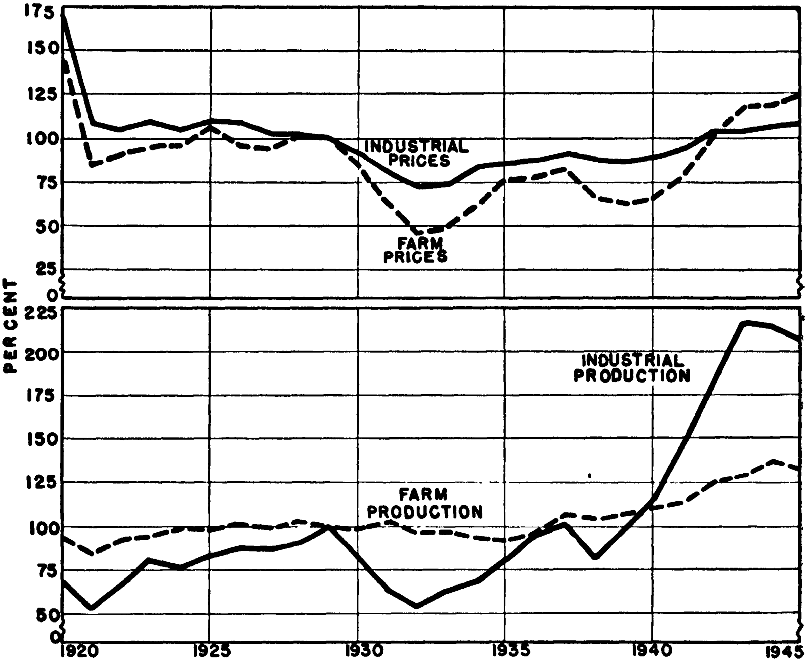

FIGURE 13. United States Agricultural and Industrial Production and Prices, 1920–1945. (Source: Data for agricultural and industrial prices from United States Department of Labor, *Survey of Current Business;* industrial production from Federal Reserve Board; and agricultural production from U. S. Department of Agriculture, Bureau of Agricultural Economics.)

The Demand for Input. Since output is functionally related in the short and long run to both supply (cost derived) and demand (utility derived), value is also a function of both the demand and the supply. The costs involved must be broken down into the prices of the services of land, labor, loans, etc., which are required to bring them into the firm or the industry, because the prices of these agents are determinants of the prices of produced commodities. Conversely the prices of these agents are determined by the prices of the commodities they help produce. All prices or values are therefore interdependent.

According to the equi-marginal principle, we can say that the marginal cost of the factor must be equal to the marginal revenue from its employment. In pure competition in the agent's market, the price of the agents must equal the marginal revenue productivity because if the addition to revenue due to the addition of an agent were less than its price, it would not pay an enterprise to add this agent. If, on the other hand, the addition to revenue were more than the price of the agent, then net revenue would be increased by adding more of the agent until its price just equalled marginal revenue productivity. The firm will be in equilibrium when this condition holds for all agents.

The demand for the services of productive agents is therefore their marginal revenue productivity. The marginal revenue productivity schedule is the addition to product due to the additional agent times the price of the product in a perfectly competitive market for the product. Where the product is sold in a market where monopoly elements are present the marginal revenue productivity will be the marginal product times its price minus the revenue lost from a reduction in price of the intra-marginal output.

Since it is necessary to recognize that more than one agent may vary in bringing the firm to equilibrium, it must also be noted that the marginal revenue curve of any one agent will be different with every shift in the quantity of other agents employed. The final point of equilibrium will occur where the curve which represents the most profitable combinations of, say, labor with varying quantities of land, intersects the curve which represents the most profitable combinations of land with labor. For every price of labor there will be a corresponding amount which the firm will demand, according to the marginal revenue productivity schedule.

Size of the units into which factors of production can be divided is important in determining how grades (efficiencies and capacities) as well as amounts of the factors will be combined. Breaking down the factors into small doses or units makes possible a more satisfactory fit of the grades or qualities and the amounts of the factors. Use of tractors and combines, in the case of agriculture, makes the doses or applications of capital in the form of machinery relatively large.

In order to use such large machine units effectively, size of the farm unit will be adjusted to the capacity of the machinery. In other words, a grain farmer will attempt to operate the number of acres which will utilize his combine efficiently. In Montana, a minimum power unit is a three-plow tractor, which will handle about 800 acres; consequently, the minimum desirable size for a dryland grain-farming family unit (alternate summer-fallow and crop plan of operation) is 800 acres. If the operator uses a larger power unit, such as four-bottom tractors, he must increase the size of his operating unit to at least 1100 acres, if he is to make efficient use of this equipment. A six-plow tractor unit is capable of handling 1800 acres, and a twelve-plow tractor 3000 acres.[7] In the case of sheep ranching, the minimum-sized unit is that which will take care of a band of sheep of around 1000 or 1200 head, since a man will be required for herding purposes, and a smaller number of sheep will not make most efficient use of his labor. It is not possible to hire less than one man, so that the number of sheep which one full-time man can efficiently herd determines the practical minimum number of sheep which should be handled by the operating ranch.

In the case of urban land utilization, doses or units of production factors are frequently very large. When the owner of an office building wishes to increase the size of his building, he must add at least one whole story. He cannot add a few dollars' worth of building, as a farmer can add a few dollars' worth of fertilizer or seed. Inflexibility in size of capital units, in the case of urban, agricultural, and mining land, often determines organization and size of the production enterprise. The extent to which the operator will approach the combination of productive factors which will result in the highest possible net profit depends largely on his ability to apply exactly the right amount and quality of each factor in the combination.

Supply of the Productive Agents. The supply of the agents of production is subject to the same general principles as the supply of any commodity or service. Following the equi-marginal principle, agents such as labor or land will be offered in service as long as the marginal cost of the service is compensated by the marginal revenue, and each unit will be placed in that service where its marginal rate of substitution is equal to its marginal rate of substitution in every other service. Each person or firm will offer its land for use as long as the cost of the marginal acre returns a corresponding increment in revenue. In each use to which any grade of land is put, the marginal rate of substitution will be the same as in every other use. If the last acre placed in wheat did not pay returns commensurate with those in some other use, the land would be transferred until the price ratio was proportionate to the marginal rate of substitution in all uses. Insofar as the substitution effect is concerned, if the last acre could not be substituted for an equal value of labor in wheat as in corn, the holder of the land would find it to his advantage to increase the land in wheat and decrease it in corn until the marginal rate of substitution between land and labor was the same in all cases. This is the equilibrium position for the individual controller of the agent, such as a landowner or a laborer.

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[7] See E. A. Starch, "Experiments in the Use of Large-Scale Equipment Under Montana Conditions," *Journal of Farm Economics,* April 1932. The experiments described by Starch show these various sizes of power units at the optimum acreages indicated, and show that when these acreages were operated the best results in low-cost operations were obtained.

When we consider the equilibrium of resources or agents as a whole, however, certain other factors must be considered. What, for instance, is the cost of land in its virgin state, or the cost of a laborer? To the individual who controls his piece of land, the cost is easily computed—it is the opportunity cost, or the next best use to which the land could be put. The landowner knows what he could get in the market for his land if it were in some other use or rented by another tenant, which therefore sets his opportunity cost of placing land in its present use. This establishes, however, only particular equilibrium of the individual firm. When we think of land as a whole, the uses to which it can be put are, in general, the uses to which it is put. Therefore, some determinant of the general supply curve of land and other resources is needed.

There is only one way to find the cost of land and it also must depend on the marginal rate of substitution. Since some of the agents of production must be produced, these become the key to our answer. Produced producers' goods or capital involve the expenditure of time which people value. The present value of the last unit of capital which is produced determines the amount and value of the last unit of other agents, such as land or labor, at least a part of whose production is a product of nature and involves no cost in the *general* opportunity sense. Land and labor will be substituted for capital at the social margin until equilibrium is established. The value of the capital at that point will establish the value of the quality and quantity of land for which it may there be substituted. A brief description of certain peculiar characteristics of land and their economic significance is pertinent at this point.

DISTINGUISHING CHARACTERISTICS OF LAND

Land possesses four characteristics of particular interest to land economists: (1) originality or non-reproducibility, (2) indestructibility or permanence, (3) immobility, and (4) wide variability or gradations in quality. These characteristics are important determinants of the nature of competition in the market for land, the rate of use which will be made of it, and the form of enterprise organization tending to exploit it.

Originality or Non-reproducibility. Certain aspects of land are said to be *original,* to the extent that they are a natural product, not the result of man's effort. For certain purposes it is useful to consider as land only those resources which are original and a product of nature. This characteristic of land gives rise to serious problems of distribution and use, since claims to the rights to income from original or natural resources cannot be decided on the same grounds as the rights to resources which have been produced through expended effort. When the supply of a commodity can be increased rather promptly and indefinitely, economic returns from given units of such commodities tend toward uniformity—as, for example, in the case of interest rates on capital for loan purposes. In contrast, any increase in demand for a commodity like land tends to widen the spread between the returns from different grades.

In certain societies, as pointed out in the preceding chapter, rights to the original resources of nature accrue to the first claimants and, in other societies, to the nation as a whole, and in still others to the central sovereign. As will be shown in later chapters, serious land problems arise in the American economy over rights to such natural and original resources as water for irrigation and multitudinous other uses. The value of the rights to these original resources is determined according to their relative scarcity in relation to the uses to which they can be put in terms of the economic principles already discussed.

Indestructibility or Permanence. A second characteristic of land is the inherent indestructibility of certain of its physical features. Site or position in physical space does not change, nor does the general topography or landscape. The economic value of site or topography may change radically with shifts in population, industry, or technology, but the physical permanence of certain aspects of land remain unaffected.

Certain qualities or attributes of land are destructible. The existence of ghost towns in exhausted mining areas indicates that the resources basic to the life and support of the community have been removed. In a strict sense, the mineral was not destroyed, but changed in form, place, and other utilities to find its use in modern industry; but certain qualities of the land from which it was removed were destroyed. Experience has shown that loss of soil fertility caused by excessive cropping or by wind or water erosion can destroy the agricultural productivity qualities of lands.

In the last analysis, the only quality of land which cannot be destroyed through human use is location, or physical extension, which is most important in urban lands or lands used for transportation. The past emphasis upon the indestructibility of land has misled many land users, and has resulted in short-sighted practices permanently damaging our land resources and decreasing the wealth of the nation.

Immobility. Land lacks physical mobility in comparison with other productive resources. The minute fraction of land which has been moved is testimony to the permanence of the landscape. It is true that the surface layer of the soil may be hauled away to other points, to be used for various purposes; but this accomplishes nothing except to reduce the surface level. Moreover, the land which was moved away requires space, or other land upon which to place it. The relative immobility of land prevents its prompt movement from surplus areas to scarcity areas; consequently, relatively high prices or high returns can be secured from land in some areas, and extremely low prices or returns, or none, in other locations. This relative rigidity or fixity of land means that the owner or user of land is helpless to move it when his market—for instance, a city—moves away from him, and as a result, he suffers severe losses. On the other hand, if the city moves in his direction he may find his income and his land values tremendously increased, without any effort on his part.

In other words, the immobility of land accounts for the slowness with which land use can be adapted to changes in price and demand. The quality of *situs*, or location, which land possesses has value only when men collectively, through preference, live in or utilize a certain area of land. Because land is immobile, different locations take on great value or become worthless, depending entirely upon the choices made by human beings. Thus, situs values are socially created values, not physically or individually created ones.

It should not be inferred from this that only land is immobile. In modern society, more and more of the fixed plants of industry are becoming immovable and highly specialized. Capital invested in land in the form of buildings, fertilizer applications, and other permanent fixtures or additions are immobile and cannot be moved in response to changes in demand and price and profit prospects. The economic effects of this are far-reaching, since immobile agents tend to have extremely inelastic supply curves and to be highly specialized. The result is a relatively small elasticity of substitution between most kinds of land and other agents. This means, in general, that it requires a large change in the ratio of the prices of the agents to cause any significant change in the ratio of quantities used. Land will be placed in production, in the long run, even if its return appoaches zero.

Wide Variability or Gradations in Quality. Land varies greatly in *quality*. Quality may be considered as comprising two major characteristics—*fertility* and *situation*. Variations in situation are, of course, caused by the area, extension, or space aspect of the physical surface of the land. One hundred acres within the boundaries of New York City are equal in physical area to a hundred acres in the semi-arid sections of Nevada; but the concentration of population in the city of New York causes a great value to be placed upon the hundred acres lying within its boundaries, while in the case of the hundred acres in Nevada, the sparsity of population in this range country results in a very small and, in some cases, a negative value[8] being placed upon it. In other words, the quality of the situation is not strictly a physical one, but one resulting from a relationship of men to land.

In contrast, the quality of fertility is more strictly physical. Some lands have been blessed with a combination of plant nutrients, soil texture and structure, topography, mineral deposit, forest stand, or

[8] Abundant space has many advantages, such as developing vision, allowing freedom of motion, widening the horizon, and so on; but as Zimmermann points out, ". . . an excess of space is one of the greatest luxuries, one of the most expensive possessions of which a country may boast," and the excessive space in North America, while not as extreme as in Australia, is a definite handicap and a weak point in the American resource pattern. (See Zimmermann, *World Resources and Industries*, pp. 151–154.) In other words, land may have negative value when an excessive amount of space exists, as it does in the more sparsely settled semi-arid and arid regions of the world.

other important characteristics which make their ability to produce food or fiber and the minerals and lumber for modern industry much greater than that of other lands. The best grades of land have not been concentrated in certain areas, and the medium and poorer grades in other areas, but all grades of land can be found in practically all areas, interspersed in a checkerboard fashion. This heterogeneous characteristic of land quality has made it difficult to develop uniform practices applicable to most grades or qualities of land. For example, practices found very successful on some pieces or types of soil have been unsuccessful or impractical on others. Consequently, each piece of land becomes somewhat personalized or individualized, and methods of land utilization must be adapted to these individual qualities.

The quality of land, whether agricultural, mineral, recreational, transportation, urban, or forest, should not be confused with the mere capacity of the land to absorb units of labor and capital input. Some lands do not justify heavy inputs of labor, capital, or management, but utilize a limited number of such inputs very efficiently and yield a comparatively high net return. Examples of such lands in the case of farming are light, sandy soils which warm up early in the spring and produce products in which the best prices and greatest profit are achieved through early marketing. Other types of lands, like the heavier loams, may require the incorporation of a large amount of labor and capital, but may be comparatively less efficient than other soils. In other words, the better land is not necessarily the land which it pays to cultivate more intensively. Productivity is a result of two factors—capacity and efficiency—and when land possesses both a large capacity and relatively high efficiency, its output will be large. However, as we have noted, the physical qualities necessary for food and fiber production are relatively limited even in the best soils, so that a point is soon reached with most lands beyond which the rate of return decreases when labor, capital, and management are applied.

This tendency of returns to diminish relative to the inputs of labor, capital, and management as the inputs are increased, necessitates recourse to additional acreages as demand for the products of land increases. Ricardo believed that because of this tendency the owners of land would grow richer and richer as society developed and the human race increased in numbers. In other words, as the number of mouths to be fed increased, with growing civilization, more acres of land would be necessary to produce the food and fiber to feed and clothe the increasing population. Ricardo contended that the "best" lands were brought into cultivation first, and that any increase in population would necessitate going out to the poorer lands, where the costs of production were considerably higher, with the result that the owner of the better grades of land would receive a differential or net return (rent) for his products because of his relatively lower costs of production.

Malthus, as we noted in Chapter III, contended that population tends to increase in geometric ratio and food supply in arithmetic ratio, so that as population increased there would be heavy pressure on the food supply. This would increase food prices and create extremely favorable markets for the products of the land. Yet, in the thirties, the United States government embarked upon an agricultural adjustment program to restrict output of farm products in order to prevent or reduce agricultural surpluses, and operated several programs to increase the farmer's returns. Apparently Ricardo's and Malthus' theories have not operated in precisely the manner in which it was assumed they would.

In general, the spread between the various qualities of land is more extreme than is true of other agents. Because of the relative scarcity of certain of the higher quality land, its marginal revenue product is still very high even when it is fully used, whereas the marginal revenue product of the less productive land may readily approach zero. The difference between these returns is the economic rent. The economic rent is defined as the return to a factor or agent above its supply price or above the amount necessary to bring it into production.

In addition to the peculiar physical characteristics of land, it will be seen from the above discussion that the economic principles of utilization and valuation of land are basically similar to those for other resources. Nevertheless, the actual application of these principles is sufficiently distinctive to require separate study, especially because of the further difference in institutional procedure surrounding the appropriation of land.

While the original characteristics of land in their current form cannot be separated from the accumulation of investment (capital), the very fact that there are original, permanent, and highly variable qualities of land leads to serious problems peculiar to the land agent. This applies to problems of taxation, of tenure, of credit, and of conservation. Part IV is devoted to a discussion of these problems.

TECHNICAL FACTORS AFFECTING ECONOMIC RESPONSES

The physical characteristics of land differ in each major type of use and cause unique forms of exploitation. Certain of the technical factors involved in each use type will be described in this section and the important economic implications developed to show how economic analysis can be used to clarify the type of market competition, typical size of the firm, rate of exploitation, and other results which follow.

Agriculture. Farming is characterized by the use of rather large areas of land requiring the exercise of entrepreneurial decisions which fluctuate daily and hourly, therefore restricting the size of unit generally in terms of labor and machinery input per firm. The extreme dependence on climatic and other physiographic changes that contribute to the flexibility of planning is characteristic of small-scale operation. Labor and machinery are not subject to routine operation as in an airplane factory and therefore require constant individual supervision and redirection with the result that large-scale assembly line technique can seldom be applied. In addition to the daily and seasonal flexibility of farming operations, the annual variations are extreme and the small-scale firm can survive the periods of loss and low income much more readily than the large corporate firms where the annual statement must be presented and the firm stand or fall on its financial record. The small-scale family unit has almost unlimited capacity to absorb the shock of depression and crop disaster through ability of the family to obtain the necessities of food and shelter from the farm under the worst of circumstances.

The small-scale enterprise in agriculture means large numbers of firms as found in pure competition. In the market for the final product of the farm most items can be graded or standardized, thus providing the second condition, in addition to large numbers, for pure competition and perfectly elastic demand curves facing individual firms. In the market for land as such, however, the individual parcels of land are immobile, vary greatly in "quality" and are identified with particular people, schools, churches, and transportation facilities which differentiate each parcel from the next. In this case monopolistic competition results since there tend to be relatively large numbers of purchasers and differentiated product. The resulting demand curves will therefore be sloping, indicating that each individual firm has some effect on the price it charges. In some cases only small numbers of firms are effectively involved as purchasers in the land market and the typical competition therefore would be described as monopolistic *oligopoly*—small numbers and differentiated product. This can be extended to include the same conditions in the buyers market—few buyers and many sellers to be described by the term monopolistic *oligopsony*. Here the supply curves to the buying firms are sloping since they can influence the supply to them of the land factor. These economic implications affect greatly the price to be paid for land and the type and rate of exploitation which results. They explain the great variations in prices paid for individual parcels of land whose physical characteristics may appear similar to most people but vary considerably in the minds of the actual buyers and sellers.

The fact that individual firms such as wheat farmers tend to face perfectly elastic demand curves from their product means that no individual can affect the price of wheat and therefore is much less likely to increase or decrease production because of price considerations than where monopolistic elements are effective. There is always the hope that others will restrict production in sufficient quantity to bring prices up to more remunerative levels when depressed prices prevail.

Because consumer preferences are relatively stable from year to year for the products as they come from the farm, and because the farm is usually operated in close conjunction with the home and family, there is a tendency to make investments in land development and equipment for long periods with the result that fixed charges are relatively high in agriculture and sensitivity to price changes relatively low. Variable or marginal costs affect the short-time decisions and these are relatively less in agriculture than in most classes of industry. Problems of taxation, mortgage foreclosure, and sporadic income are especially severe as a result of the high ratio of fixed costs.

Forestry. While a not inconsiderable part of the forests of this country and of other parts of the world are in farms, by far the greater part is in virgin areas of very sparse population. The care of forests requires so few individuals per unit area and the harvesting process lends itself so readily to very large-scale mobile machinery that the size of the harvesting firms tends to be rather large. Consequently their numbers in any one area are small and are characterized by various forms of monopoly or oligopoly. Many forest lands are under direct public control because of their long-term public welfare aspects, and their multiple uses for forestry, grazing, watershed, and recreational functions. In many areas private exploitation cannot utilize these resources fully since certain social benefits accrue for which no charge can be levied by private enterprise. The price system thus requires guidance through public ownership. Many forests are harvested by private enterprise although by contract with the government.

Since much of the forest area of the new world has been subjected to very rapid and clean-cut harvesting or to fire, maintenance requires very long term investment. Many hardwood forests require 150 years or more for full maturity. As a consequence few individual firms can afford to undertake such long-term investment at prevailing rates of interest. The impatience rate for individuals is too high and consequently much of the development work in silviculture has been taken over by public agencies. The rate of interest which a government can use for its calculations is much less than that of private individuals, and consequently it is possible for public enterprise to make such investments in the forests. The relation of the rate of interest to conservation will be developed more fully in a later chapter.

Mining. In general, mining, including metals, coal, and oil extraction, is one of great risk in the early stages of prospecting. In the pioneer stage this has tended to attract foot-loose individuals who are later displaced by large scale corporate enterprise operating as monopolists or oligopolists able to influence the price of their products by the amount of their individual output. Technical factors in the extraction of minerals, especially the use of large-scale specialized equipment located in very limited areas, tend to make monopoly, or at least oligopoly, the prevailing type of competition. The result of this form of enterprise has been the typical history of monopoly and oligopoly—rapid technological progress through specialization, and individual restriction of production beyond what would occur if demand curves for the firm were perfectly elastic, as for instance under pure competition or maximum fixed prices.

The unique location of minerals and oil results in the differentiation of the land resources and a type of monopolistic competition in the market for those resources. With small numbers of firms the result becomes one of oligopoly with differentiated resources. This type of competition helps to explain the problems of many oil fields where "cutthroat" competition occurs due to the fact that each individual can affect the price of his product. When any firm fails to see his own price changes reflected in the prices and output of other firms in the "industry" he may drop his price to increase sales, only to find that his competitors drop theirs, further leaving the first with a lesser share of the market than before the original drop in price. This type of price cutting cannot occur in pure competition where the individual firm accepts the price as given and makes his adjustments in output without any regard to his own influence on price.

Recreation. The use of forests, lakes, and mountain areas for recreation seems to lend itself most readily to public ownership and control. Most of the rights connected with the ownership of lands for such purposes cannot readily be sold to users at rates sufficient to encourage the kind of utilization and development which is demanded by people as a social group. In addition, most recreational areas are very primitive and therefore considered in the mores and folkways as the heritage of all who wish to use them. The services of the forests for hunting and fishing for instance are sporadic and not readily valued in the market place. Where this occurs government ownership and the charge of token fees or licenses is the general rule. In many cases recreational areas are multiple use areas which include forestry, grazing, watersheds, etc., and the allocation of use rights to each can most readily be decided by public agencies whose support comes largely from tax sources rather than from the sale of the rights to use.

The land factor is used very extensively and is combined with very limited quantities of capital and labor.

Water Resource Use. Both technically and economically water use represents the extreme differences between power sites and navigation or irrigation and the use by humans to quench their thirst. Each of these uses has adapted itself to a different type of entrepreneurial organization and operates typically under different forms of competition. Power sites are usually exploitable only by relatively large-scale corporations under government regulation or government ownership. The development of water for navigation is usually a matter for government enterprise through channel deepening and building of locks and canals. The operation of the ships is usually by private entrepreneurs varying in size from very small firms to huge steamship corporations. Irrigation has become more and more a matter for public agency development and small private firm exploitation with limited monopolistic competition stemming from the unique rights to water use according to the prevailing doctrines of the society, riparian or appropriation as the case may be. These will be discussed more fully in the chapter dealing with water utilization.

Watershed protection is usually a matter of government regulation since private firms who use the areas for grazing or some other purpose cannot sell their protective services in the market place because no single person or firm can allocate the worth to him or it of avoiding floods in the valley or of maintaining adequate drinking or irrigation water supplies. No one person or firm could gain enough from paying for protection of this kind to justify the expenses attached, but the people as a whole or in cooperative units do find it practicable.

Urban water uses are very often handled by municipal agencies for the same reason that only large-scale effort can justify the development of drinking and sewage uses of rivers and lakes. If it were left to single large firms, their strategic position would be so great through monopoly powers that people fear such forms of exploitation of essential services.

Urban Land Use. Land tends to lose much of its strategic influence in the economic organization and processes when it becomes an urban site. In general the ratio of men and of capital to land is so high in cities that these other factors can quite readily be substituted for land and the forms of competition vary widely as they are related to land use, depending on the nature of the industry involved. It is important, nevertheless, to point out that land does have unique site value and the urban market for land, just like the agricultural market, is one of monopolistic competition with differentiation in quality an important determinant of value and use.

Transportation and the Location of Industry. Location in space and time is largely a function of transportation. Many unique land elements such as mines, fertile land, or oil deposits derive their value from their accessibility through transportation channels. The rates charged for moving men and materials greatly affects the value of the products of every area. Serious problems follow from the fact that most forms of transportation such as railways, ships, trucks, and airplanes are largely operated under forms of oligopoly and monopolistic competition. If transportation firms were given a free hand to charge fees purely in accordance with their own power to affect the market and achieve maximum profits, the position and profitability of other industries would be subject to the whims and fancies of the transporters. This becomes especially important when it is recognized that transportation charges lend themselves very readily to a form of monopolistic price policy known as discrimination which cannot occur where competition is pure.

In order to achieve maximum profits it is in the interests of any firm to separate the demands of individuals or groups and charge different prices for each. In most industries, even where monopoly is present, discrimination, except on a very limited scale, is very difficult to practice since the buyers at the lower prices can resell at higher ones, thus bringing all prices to a market level. In railroad transportation, however, the services of carriers cannot be resold and railroads can readily separate their customers into groups charging varying prices to each. Those with the more elastic demand curves such as those who could use other modes of transportation if railway fares increased will be charged lesser rates than those whose demand for railroad service is inelastic and vital to their operations such as those who have no alternative means of transportation.[9]

The result of this strategic nature of transportation and its monopoly power, especially of discrimination between places, commodities, and persons, has led to widespread regulation of rates and services and sometimes to public ownership such as in certain European countries and Canada where railroads are wholly or partially government owned.

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[9] For a discussion of the theory of discrimination see Joan Robinson, *op. cit.*, chaps. XV and XVI.

The Theory of Economic Location. Alfred Weber argued that location of manufacturing industries is determined by the ratio between weight of the localized material and weight of the product (assuming transportation costs to be variable and labor costs constant). This ratio Weber called the *material index*,[10] and it represents weight loss of the material in process of manufacture. Extraction of gold from its ores requires an extremely high tonnage of material per ton of product, and weight loss is close to 100 per cent; while the hand shoemaking industry has a very low percentage of weight loss, and would be located close to the consuming areas (centers of population). Most forest products tend to be manufactured in forest areas, and ores tend to be smelted near the mines, if coal or other cheap fuel sources are available. On the other hand, products involving addition or use of some product available nearly everywhere tend to be manufactured near areas of greatest consumption.

A good example of the effect of the "material index" upon manufacturing locations is the westward movement of the U S. butter manufacturing industry. The center of butter production was formerly New York State, but eastern dairy farms now produce fluid milk for the inhabitants of the large eastern industrial cities, while creamery butter manufacture has moved to the midwestern dairy section, where the finished product, butter, can be shipped East with relatively little expense. In other words, the weight of the finished product is much less than the weight of milk from which the butterfat is secured to manufacture the butter. Perishability is another important factor. Milk used for fluid consumption must be kept fresh, so that refrigeration costs, as well as transportation costs on the rather bulky fluid milk, are large. A third factor is the large market for skim milk, a by-product of butter, in the hog industry of the Middle West.

The question of manufacturing location resolves itself into a matter of balancing the transport advantages of nearness to materials and nearness to markets. For each combination of material sources and markets, there must be a point, or points, at which total transportation costs involved in assembling materials and delivering the product to market are less than they would be elsewhere. In the absence of production cost differentials, the base location for the production process is at the point of minimum transportation costs.[11] This point, for an industry, may be at some source of materials, or at some market, or perhaps at neither. Consequently, it is essential to know how important the transportation costs are in relation to differentials in production cost.

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[10] C. J. Friedrich, *Alfred Weber's Theory of the Location of Industries*, University of Chicago Press, 1929, p. 60.

An example of the influence upon location of manufacturing enterprises exerted by small changes in relative freight rates on the raw material and finished product may be taken from the American flour-milling industry, ordinarily referred to as a "material-oriented" industry, because material transportation costs generally outweigh differentials in production cost, nearly seven pounds of wheat being required to make five pounds of flour.[12] This fact favored Minneapolis, compared with Buffalo and Rochester, as center of the milling industry after the center of wheat growing had moved to the Plains states. But in the period 1905–1930, changes took place resulting in a rise in cost of shipping flour, relative to the cost of shipping wheat, on the Great Lakes. This and other factors gave the advantage to Buffalo, and in 1930, for the first time, Buffalo milled more wheat than Minneapolis.[13]

Weber argued that when labor costs vary, an industry deviates from its transport location in proportion to the size of its labor coefficient (labor cost per unit weight of materials and product moved). Extent of the deviation caused by varying labor costs is determined by the ratio between cost of labor per ton of product (the labor index) and total weight of all goods (product, material, fuels, etc.) transported. This total weight is called *locational weight,* and the ratio is called the *labor coefficient.*[14] If transportation costs were constant, all production would go to locations with lowest labor costs.

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[11] Wilhelm Launhart, *Mathematische Begrundung der Volkswirtschaftslehre,* Leipzig, 1885; and Alfred Weber, *Uber den Standort der Industrien,* Erster Teil, *Reine Theorie des Standorts,* Tubingen, 1909, translated by C. J. Friedrich as *Alfred Weber's Theory of the Location of Industries,* University of Chicago Press, 1929.

[12] "Transport-oriented" industries are those for which differentials in transportation costs generally outweigh differentials in production costs. Transport-oriented industries may be further classified into "material-oriented" and "market-oriented" industries, according to which element of transportation cost is predominant. (E. Hoover, *Location Theory and the Shoe and Leather Industries,* Harvard University Press, 1937, p. 36.)

[13] *Ibid.,* p. 38.

Weber draws certain conclusions in regard to location of manufacturing industries. He states that, generally speaking, industries with a high locational weight are attracted toward material, and those with a low locational weight are attracted toward consumption, because the former have a high material index and the latter a low material index. He proposes the formula that all industries whose material index is not greater than one, and whose locational weight, therefore, is not greater than two, lie at the place of consumption. Pure materials (those entering without weight loss into the final product, or with a weight loss of zero or practically zero) can never bind the product to their deposits. (The sum of the component weight of their deposits is always equal at most to the weight of the product, and therefore the weight of their material index is never more than one.)

Weight-losing materials, on the other hand, may pull production to their deposits. For this to happen, however, Weber argues that it is necessary for the material index which they co-determine to be greater than one, and for their portion of the material index to be equal to that of the remainder, plus the weight of the product. Stated more simply, their weight must be equal to or greater than the weight of the product plus the weight of the rest of the localized materials.[15]

Von Thunen's Theory of Agricultural Enterprise Location. In agricultural production, geographical position of agricultural land relative to available transportation, cities, and consuming centers plays an important part in determining types of farm products to be raised in different areas. The German economist Von Thunen undertook to determine what kind of agricultural production should be carried on at a given place and to analyze influence of transportation upon localization of agricultural production.[16] Von Thunen pictured a city (one consuming center) lying in the center of an absolutely even plain, without rivers or any means of transportation except wagons, with equal transportation rates, equal wages, and equal soil fertility or productivity throughout. He also assumed a limited number of agricultural products, and then proceeded to explain how production of these would be distributed over the plain surrounding the city. He concluded that concentric zones of production would be established around the city, the most bulky and most highly perishable products being produced closest to the city, and the less bulky and less highly perishable products in outer zones. Thus, in zones close to the city vegetables, berries, and milk (either highly perishable or bulky products, or both) would be produced. In zones farther out would be produced butter (less bulky and less perishable than milk), root crops, (though bulky, not so perishable as fresh vegetables), and grain to be fed to livestock which would be transported to market on the hoof. In the zones farthest out would be range for grazing livestock. Von Thunen placed forests in the second zone, comparatively close to the city.

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[14] Friedrich, *op. cit.*, pp. xxiv and xxv.

[15] *Ibid.*, p. 61.

[16] Johann H. von Thunen, *Der isolierte Staat*, Jena, Gustav Fischer, 1910.

It should be remembered that in von Thunen's time forests furnished fuel and building materials, which are very bulky; and since only wagons were available for transportation, the forests had to be near the city. However, natural forest areas might have no such relationship to points of consumption as the forests of von Thunen's isolated state, where it is implied that forests were "man-made" and deliberately placed in the second zone. Nevertheless, in reestablishing forests in areas where forest resources have been depleted, location in relation to population centers should be given serious consideration. It is interesting to note that the great lumber markets in the United States are in the East, where the price is set, while the largest forest resources still available are located in the western part of the country, with the result that transportation costs are a considerable factor in lumber costs.

Von Thunen next assumed a river flowing through this plain and city. The effect of this new transportation method, assuming both upstream and downstream transportation to be available, would be to extend the concentric zones in both directions near the river—but particularly upstream, because transportation downstream would be faster and easier (see Figure 14). If water transportation were limited to downstream movement only, the effect would be to extend the zones upstream near the river, but not along the sides of the river below the city. This situation is well illustrated by transportation of produce down the Ohio and Mississippi rivers to New Orleans during the early development of the Ohio Valley. Produce from this area was loaded on barges and floated downstream to New Orleans, making cheaper transportation available for Ohio Valley producers. However, upstream transportation was impossible, since steamboats

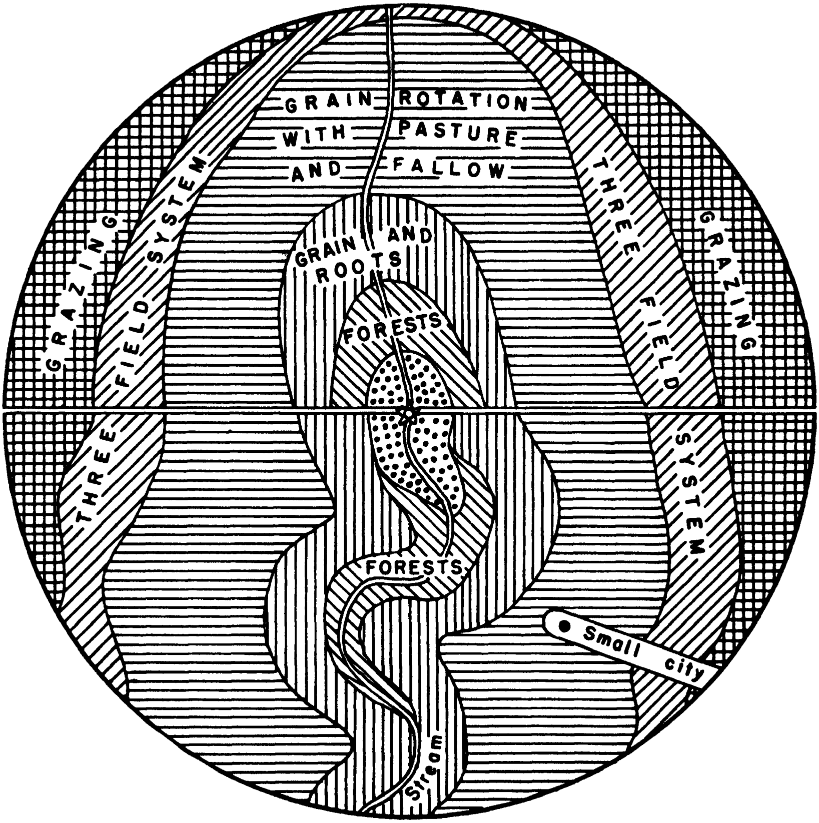

FIGURE 14. Land Utilization as Determined by Location and Transportation Facilities, Based on von Thunen's Isolated State. In the zone immediately surrounding the city, no regular order of crops is followed. Crops are planted to suit the climate, soil, and market. In the zone devoted to grain and roots, von Thunen indicates such crops as potatoes, barley, rye, legumes, winter grain, and summer grain would be grown, probably in a rotation of grain with leafy plants such as legumes or root crops. In the zone indicating grain rotation with pasture and fallow, von Thunen used seven parts in his rotation, namely, (1) rye, (2) barley, (3) oats, (4), (5), (6), pasture and (7) fallow. In the three-field system, von Thunen mentions (1) rye, (2) barley, and (3) fallow.

were not then available, with the result that products purchased by Ohio Valley producers had to be hauled in overland. Barges piled up at New Orleans, and were available there for almost any price while, at the head of the Ohio, a premium was paid for boats or shipping facilities.

If it is assumed that the stream cuts transportation costs to one-fifth that of wagon transportation on the upstream side, the first zone will be extended along the river upstream in such a manner that combined land and water costs will equal costs of land transportation for those parts of the plain not having access to river transportation. The other zones will be elongated similarly upstream. On the downstream side, below the city, the zones will be elongated along the river if upstream transportation is cheaper than land transportation. With modern steam engines, upstream river transportation is nearly as fast and efficient as downstream transportation. In modern economies, streamlined railroad passenger service and fast freight transportation, paved highways, motor truck lines, and airways extend city market areas, or zones, out along these transportation channels. In other words, these transportation lines produce bulges in the zones, and to the extent that modern transportation and refrigeration techniques have overcome perishability and bulk limitations, von Thunen's concentric circles no longer restrict the market areas which furnish goods and services to modern consuming centers.[17]

Other Factors Affecting Location of Industries. Land is the only element absolutely fixed in position, and *spatial immobility* might be used as a distinguishing definition of land. The economics of location is concerned with spatial adjustment of mobile production agents to land in a way determined by human wants and capacities.[18] The distribution of natural resources furnishes the basic material for social adaptation. This adaptation is dynamic, because man is able to combine agents of production so that natural resources yield consumable utilities, and the creative effort of human societies to modify action of the geographic environment upon their want-satisfying activities is primarily in technological development.[19] The relationship between the point of consumption and location of natural resources used to manufacture consumable utilities gives rise to the transport-cost factor, which limits the extent to which comparative advantage between areas can operate.

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[17] The extent to which the market areas of the city of New York have been extended by modern transportation facilities is illustrated by the shipment of fruits and vegetables from producing points like Florida and California. This brings the areas producing vegetables and fruits close to New York City into direct competition with extensive outlying areas. Thus, it would seem that there would be less tendency in the future to construct greenhouses for fresh vegetable production close to New York City, and more reliance on fresh vegetables, produced in other areas thousands of miles away, made readily available by modern transportation.

[18] Hoover, *op. cit.*, p. 3.

If the cost of extraction of each commodity at each source is known, the delivered price at any one point will be cost at the source plus freight charges. The lowest combination of cost plus freight determines from which source any given consumption point

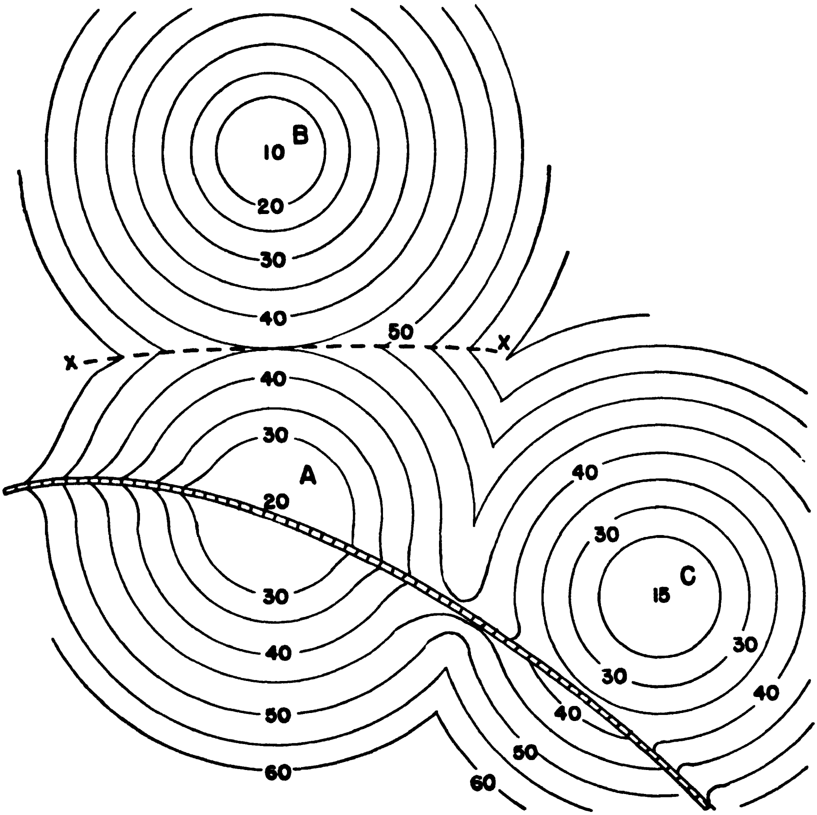

Figure 15. Isotims, or Contour Lines Connecting Points of Equal Delivered Price for Extractive and Distributive Enterprises. (Based on Edgar Hoover, *Location Theory and the Shoe and Leather Industries,* Harvard University Press, 1937.)

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[19] W. H. Dean, Jr., *Theory of the Geographic Location of Economic Activities,* Edwards, 1938, p. 1.

will be served. This principle can be represented conveniently by a system of contour lines, or *isotims*, connecting points of equal delivered price.[20] Since price is at a minimum at the source of supply, these isotims will be concentric about the source, but any irregularity in the pattern of transport costs will, of course, distort the delivered price pattern (see Figure 15). The system of contour lines or isotims takes into account all costs of and restrictions on transportation, as well as costs of material, and illustrates rather realistically how the pattern of economic activities is established to adapt mobile production factors to the immobile agent, land.

While transportation or distance from consuming points to location of raw materials is a very important factor in location of industries, other factors play an important part—for instance, availability of labor supply, supply of capital, climate, or topography. A dense population means an abundant labor supply, which permits more intensive utilization of natural resources. Where population is sparse, farming will be extensive, while densely populated areas will grow very little livestock but will produce crops which use a great deal of labor and those which yield a large amount of food per acre, like potatoes, rice, corn, and vegetables. Products which have the greatest comparative advantage in a densely populated area are those which most need hand labor. Laces, linens, and fine textiles are made in the more densely populated areas of Europe, as are also high-quality metal goods, jewelry, and toys. In the United States, the clothing industry is located principally in the East, and the farm machinery industry in the Middle West. American industry has been slow to develop manufacture of the finest grades of goods, but has instead concentrated on large-scale machine production, because the supply of natural resources and availability of large foreign markets relative to the supply of labor placed a premium upon labor and encouraged development of machine production rather than hand-labor methods. The limited supply of capital available during the nineteenth century for developing the large natural resources of the United States was important in developing rather extensive utilization. It takes a fairly long time to accumulate a large supply of capital, because it must be saved out of the surplus above current consumption. With capital scarce, more land resources will be used in proportion to capital inputs; or, in other words, extensive utilization will develop. In the case of manufacturing, if ample capital is not available the plants will be concentrated at the most favorable points for accessibility to markets.

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[20] Hoover, *op. cit.*, p. 8. Alfred Weber uses the term *isodapane*, meaning "equal cost" (from the Greek *iso*, meaning equal, and *dapane*, meaning cost).

Climate is an important factor determining comparative advantage for agricultural production. Cotton will not be grown in Montana, for the simple reason that the climate is unsuitable. Butter and many kinds of cheese cannot be made to advantage in warm climates; and the English claim that the dampness of their atmosphere aids their spinning. Topography also may affect land utilization, particularly for agricultural production.

Historical reasons are more important in determining location of industry and adaptation of mobile production factors to the immobile agent, land, than most students realize. Once established, manufacture of a certain commodity will tend to be continued in a given area, even though raw-material and fuel sources, transportation facilities, and supply of labor and capital would justify moving it to another area. Large investments in plant have been made, and until the plant wears out, it may pay the entrepreneur to operate it until it does wear out rather than build new equipment and facilities in other areas. Moreover, around a manufacturing plant or special enterprise which has been operated in a given area for any considerable time, a local supply of skilled labor usually develops, and being comparatively immobile, tends to remain at lower wages rather than move to new areas where wages might be higher. Also, the consumers attach considerable value to goods manufactured in long-established locations, and it frequently takes much time to convince the public that products from a new area are as good as those from the old.[21] Thus, such forces as necessary supply of skilled labor and early development of the industry exert a strong influence on the location of industry, and may be sufficiently influential on it to offset advantages due to transportation or wage differentiations alone.

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[21] For a more detailed explanation of these factors, see Black and Black, *op. cit.*, p. 233.

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CHAPTER SIX

LAND RENT AND INCOME DISTRIBUTION

WE LEARNED in the preceding chapter that returns to each of the factors of production tend to equal their respective marginal productivities. Thus, the level of wages of a particular kind of labor under perfect competition is equal to the marginal productivity of that labor or the addition to total product resulting from the application of the last unit of the labor force. Similarly, the return to land depends upon its marginal productivity. We learned that under perfect competition the price of each productive agent is equal to its marginal product. Our economic system is continually trying to readjust itself to a new set of conditions necessitated by changes in demand and supply, created as a result of changes in wants, resources, and techniques of production characteristic of a modern dynamic society. In reality, therefore, equilibrium in the economic system is probably never attained.

THE NATURE OF RENT

Any intelligent attempt to improve our economy demands, first of all, a clear understanding of the functional nature of the distribution process—that is, of the forces which determine the returns to the various productive agents. Under the institution of property, lands used in production are owned by individuals who maintain the right to receive the income earned by the lands. The peculiar physical characteristics of land noted in the preceding chapter have led many to conclude that property in land gives greater possibilities of monopolistic gain than ownership of the other productive agents, and that therefore land rent is a monopolistic return. What are the causes and nature of land rent? Is land rent a monopoly return or an unearned increment and, if so, to what extent? Wherein does it differ in cause and nature from returns to owners of other production factors? Would it be in the interests of society to confiscate economic rent? Should land rent be treated any differently from returns to other factors of production?

Rent as a Surplus Return. The word "rent" etymologically means any income or yield from an economic agent, but in economics it has come to be used almost entirely in connection with income from land. Surplus income for any factor of production results whenever any unit is receiving a greater income than the minimum amount necessary to induce that factor to remain in its present use. Thus, the *surplus* of receipts over the minimum supply price of a factor may be called *economic rent.* Defined in this way, such surpluses or rents can be found in incomes received by some units of each factor of production—labor, capital, and management, as well as land. In the case of capital, the amount of funds required by borrowers is greater than the amount which would be supplied if no interest were allowed, and so those savers who would be willing to lend part of their funds without interest are nevertheless able to charge the full market rate of interest on sums they lend. The difference between the amount of interest they actually get and the amount of interest for which they would have been willing to lend, had the demand been less, may be referred to as a *lender's surplus* or *lender's rent.*

The same principle applies to labor. For example, if some workers in a trade are willing to work for $20 a week, but the demand for the product is such that the trade must attract other workers who will not work for less than $25 a week, the first workers will then be receiving $25 also, including a rent of $5 a week (the difference between what they would have been willing to work for and the amount they can actually get because of greater demand for their services). The same type of surplus may arise in the earnings of the owner-manager of a business. The minimum supply price for his services will be the amount necessary to keep him in business—that is, the amount necessary to prevent him from giving up the business and going to work for someone else, or going into another business. Any surplus that he happens to receive above this minimum amount may be considered as a rent.

From the above analysis, it will be seen that rent, defined as the surplus of receipts over minimum supply price of production factors, can arise only when the supply of any productive agent is less than perfectly elastic. By definition, if the supply were perfectly elastic, the supply prices of all units of the factor would be the same. Consequently, no unit would earn a surplus that could be called a rent. When the supply of a factor is less than perfectly elastic, the units which have the lowest supply price will be used first, and there will be no rent so long as only these units are needed (if the supply prices of all such units are the same). When demand increases to a point where it is necessary to employ additional units, rent will arise on those units of the factor whose supply price is lowest, since in a competitive market they will be able to demand the same market price as that received by those units which will be offered at the market price. Thus, rents constitute a surplus over the normal supply price of a unit of a productive agent made possible because the supply of the factor is less than perfectly elastic and because the demand for the factor is sufficient to necessitate use of more units than would be offered at the lowest supply price of any unit.

Many economists have reserved the term "rent" for use in connection with land only, using terms like "lenders' surplus" instead of "lender's rent." "workers' surplus" instead of "workers' rent," and "excess profits' instead of "rent of management," but this does not mean that the nature of land rent is any different economically from that of the rents or surpluses of these other productive agents. The economic reasons for the existence of land rent are identical with the causes of lenders' surplus, workers' surplus, and excess profits. The fact that land resources, in the aggregate, are fixed by nature, and that human efforts cannot change their amount, has been largely responsible for the confusion. From society's point of view, but not from the point of view of the individual user, any payment for the use of land resources is a surplus over supply price, and the rent of land cannot be considered as a cost of production. How is it possible, then, to explain payments to those who happen to own land?

Occurrence of Rent on Lands of Equal Productivity. Let us assume, first, that all land is capable of producing only one product, and is of equal productivity or fertility.[1] Under these conditions, with pure competition, increasing demand for the product will be met by an increasing number of operating units, each producing at the point of minimum average total unit cost of all operating units in the industry, and there will be no surplus over cost in the form of rent. The total income from the product will be distributed as wages, interest, and wages of management. No producer would pay anything to use the land, because total cost would likewise equal total revenue and nothing would be left.

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[1] The analysis of the occurrence of rent on lands of equal and unequal productivity has been adapted largely from Meyers, *Elements of Modern Economics, pp.* 267–273.

If demand for the product increases still further, increased output can be obtained by adding more units of the other factors of production to the fixed amount of land in existence. The Principle of Substitution (discussed in detail in the preceding chapter) will then bring about increasing marginal and average costs as an increase in output is attempted. This will necessitate a rise in price equal to the new marginal cost. Each producer will increase output up to the point where marginal cost equals price, but at this output average total unit cost will be less than price, marginal cost being greater than average cost, and total revenue will be greater than total cost. Each operating unit will be in equilibrium because marginal revenue (which, under pure competition, is the same as price) is equal to marginal cost, and the industry will be in equilibrium because no new operating units can enter into production to take advantage of the surplus, since there is no more land for them to use. This surplus is the economic rent of land, and if the landowner leases the land to others instead of using it himself, competitive bidding for the use of land will force the man who does obtain the use of it to pay the full amount of economic rent. With only one bid, the landlord could refuse to lease the land for a smaller rent than he could make by using it himself to produce the product. But even if the landlord decided to rent the land free of charge, tenants would produce to the point where marginal cost equaled price, and secure the economic rent for themselves.

Occurrence of Rent on Lands of Unequal Productivity—Differential Rent. In the preceding analysis, all land was assumed to have equal productivity or fertility. Let us now make a more realistic analysis, and assume that there are different grades of land. Obviously the best (most productive) grade will be used first. If demand for the product is so small that all the best land is not needed for production of the desired output, the situation will be identical with that just described, where it was assumed that there was only one grade of land and not all of it was used. Price will equal minimum average total unit cost, and no rent will develop. After all the best grade of land is in use, any additional increase in demand for the product will be met by more intensive cultivation of this best land. Price will rise to cover the new marginal cost, which will be greater than average total unit cost, and rent will occur on the best land.

The Intensive Margin. As demand increases still further and output on the best land is expanded, a point will be reached where rising marginal cost on the best land just equals minimum average total unit cost on the next best grade of land. This point is referred to as the *intensive margin* on the best grade of land, or the point at which it does not pay to add further units of capital, labor, and management. At this point, it will not pay to intensify production on the best grade of land, and the second grade of land will be brought into use. The second grade will earn no rent, because price of the product will just equal minimum average total unit cost.

The Extensive Margin. If demand for the product increases to the point where all the second-grade land is in use, output will be increased on the second-grade land by more intensive methods of use beyond the point of minimum average total unit costs (output on the first-grade land being expanded still further). The new price of the product would then be equal to marginal cost, and greater than minimum average total cost on the second-grade land, with the result that second-grade land would begin to earn a rent, although not as much as the first-grade land. As demand increases and price rises still further, a point will be found where rising marginal costs on the two grades of land, from increased intensity of utilization, are exactly equal to minimum average total unit cost on a third grade of land. At this point, the third grade will be brought into use, with results similar to those of using the second grade. This process would continue with successive price rises for as many grades of land as there are in existence, and the last grade of land utilized would be referred to as the *extensive margin.*

The concept of intensive and extensive margins in rent analysis should not be in terms of margins for labor and capital. Land has its own marginal productivity and the intensive margin is not the amount of product added by the last unit of capital and labor, but by the last unit of each quality of land which is available for use.

The extensive margin is in reality a marginal productivity of land of zero. Figure 16 illustrates diagrammatically how economic rent may be measured when different grades of land are utilized, assuming pure competition in the production of any one product. It will be noted from this Figure that the difference between marginal cost, which represents the cost of producing the last unit of output as indicated by the curve *MC*, and average total unit cost, which is the average cost per unit of producing the entire output and which is represented by the curve *AC*, is the basis for measuring the economic rent secured on any grade of land with a given price. P_1, P_2, P_3, and P_4 are the various possible prices of the product, which in Table 4 are 40¢, 50¢, 75¢ and 90¢ per bushel, respectively; and

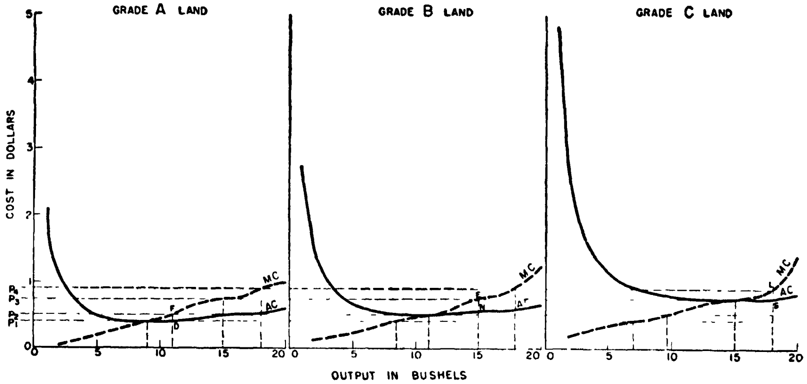

FIGURE 16. Measurements of Economic Rent on Different Grades of Land. (Based on hypothetical data in Table IV.)

Q_1, Q_2, Q_3, and Q_4 are the outputs produced at these prices or, as shown in Table 4: 9, 11, 15, and 18 bushels, respectively. It will be noted that at price P_1 (40¢) there is no rent, because at this point grade *A* land would be the only land in production and marginal cost and average cost on this land would be identical (40¢).

Between prices P_1 (40¢) and P_2 (50¢), grade *A* land would be the only land in use, price would equal marginal cost, and the difference between marginal and average cost, multipled by output, will constitute the economic rent on grade *A* land. At price P_2 (50¢), rent on the grade *A* land is shown by the area P_2FDP_1, and is found in Table 4 to be 88¢, or 11 units of output multiplied by 8 cents, or the difference between marginal cost (50¢) and average cost (42¢). At price P_2, grade *B* land is brought into cultivation, but

TABLE 4. Hypothetical Average Unit and Marginal Unit Costs of Producing Corn on *A*, *B*, and *C* Grade Lands Illustrating Occurrence of Rent with Different Levels of Corn Prices (see Figure 16)

Output in Bu. of Corn	*A* Land		*B* Land		*C* Land	
	Average Unit Cost	Marginal Unit Cost	Average Unit Cost	Marginal Unit Cost	Average Unit Cost	Marginal Unit Cost
1	$2.10	$...	$2.69	$...	$4.84	$...
2	1.07	.05	1.42	.15	2.52	.20
3	.73	.10	.99	.18	1.75	.26
4	.58	.15	.79	.20	1.38	.31
5	.49	.20	.67	.25	1.16	.35
6	.44	.25	.60	.30	1.04	.38
7	.42	.30	.56	.35	.92	.42
8	.41	.35	.53	.40	.88	.46
9	.40[a]	.40[a]	.52	.45	.84	.50
10	.41	.45	.51	.48	.80	.55
11	.42[b]	.50[b]	.50[b]	.50[b]	.78	.60
12	.43	.60	.51	.55	.77	.65
13	.45	.68	.52	.60	.76	.70
14	.47	.72	.53	.70	.75	.73
15	.49[c]	.75[c]	.54[c]	.75[c]	.75[c]	.75[c]
16	.51	.78	.56	.77	.76	.80
17	.52	.80	.57	.82	.76	.85
18	.54[d]	.90[d]	.59[d]	.90[d]	.77[d]	.90[d]
19	.57	.95	.61	1.08	.79	1.15
20	.59	1.00	.64	1.20	.82	1.40

[a] At P_1 (40¢ per bu.) where marginal unit cost and minimum average total unit cost are equal on *A* land there is no rent on any of the lands.

[b] At P_2 (50¢ per bu.) where marginal unit cost and minimum average unit cost are equal on *B* land there is no rent on *B* land but a rent on A land of $.88 (11 units × difference between average unit cost and marginal unit cost, or $.50 – $.42, or 8 cents).

[c] At P_3 (75¢ per bu.) where marginal unit cost and minimum average unit cost are equal on *C* land, there is no rent on *C* land but a rent of $3.15 (15 units × difference between average unit cost and marginal unit cost, or 75¢ — 54¢, or 21 cents) on *B* land and of $3.90 (15 units × 26¢) on the *A* land.

[d] At P_4 (90¢ per bu.) all three grades of land would be yielding rent as follows: *A*, $6.48; *B*, $5.58; and *C*, $2.34.

since at this price marginal cost and average cost are equal, the *B* land yields no economic rent. Between prices P_2 and P_3, grade *B* land yields rent, and that on grade *A* land is correspondingly increased. At price P_3, when grade *C* land comes into production, the rent on grade *B* land is shown by the area P_3ENP_2 and the economic rents on grades *A* and *B* amount to $3.90 and $3.15 respectively (see Table 4).

At price P_4, grade *C* land would also yield a rent, and the amount would equal the area of the rectangle P_4LSP_3, or $2.34, as shown in Table 4. A careful analysis of Table 4, and close study of Figure 16, will indicate the method by which economic rent is determined for various grades of land, and the amount of such rent, given the cost and price situations listed in Table 4, and assuming pure competition in the production of any one product.

Rent as a Cost of Production. Economic rent on land that has only one particular use will be determined by the difference between the price of the product and the costs of labor and capital used in producing each unit of output. Under these conditions, rent is not a cost factor that helps to determine output and price. In the competition for use of land that has several uses, a particular use will have to pay a rental at least equal to that which the land could earn in its best alternative uses, in order to obtain use of the land. Expansion of output accompanying increased demand for the product will necessitate drawing land away from other uses, and the price which will have to be paid for the use of the land will rise. The minimum supply price of each piece of land will be the amount which the land could earn in its most profitable alternative use, and may be referred to as the *opportunity price* of the land or *transference cost.* In other words, rent is determined simply by supply and demand with opportunity for other uses as one factor limiting supply or increasing demand.

The use which can outbid all other uses to which a piece of land may be put may be considered the *highest and best use,* from a strictly economic standpoint, for this land.[2] The price of the product will be determined at the point where price just equals marginal cost (including transference cost, or opportunity cost of the land) on the highest-cost land to be utilized in production. The *marginal* land (that land which will leave production first, if the price of the product falls, and where price just equals average total unit cost), need not be the least efficient nor the poorest land in use. Land best suited for the production of corn may also be the best suited for producing milk. If this were the case, such land might be the first to be withdrawn from corn production and turned to dairy farming, if the price of corn dropped.

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[2] The highest and best use from an economic point of view may not be the highest and best use from a social point of view. Letting crops fight it out for the use of land under a system of laissez faire, on the grounds that whatever pays most or best should have the right to use the land, may result in impoverished soil and distressed families. This policy, which was largely followed by the United States prior to 1933, resulted in the disappearance of forests which were not replenished, destruction of soil fertility, increased soil erosion,

If the transference price of land to a given industry is rising as more land is used, firms using land with the lowest opportunity price will be able to obtain the same price for their product as firms using the highest-cost land. They will expand output to the point where marginal cost equals price, but a surplus return will be secured on the intramarginal lower-cost units of output. If the firms using land with the lower opportunity prices lease the land outright, they will be able to secure the surplus; if not, the landlord will be able to secure the full economic rent as soon as the lease expires, through competitive bidding by tenants.

For the individual operator, all rent of all productive agents must be considered a cost of production.[3] If the operator leases land, cash payment of the rent is obviously a cost. If the landowner uses the land himself, the full payment he could have received by leasing the land will be an opportunity cost. While this is not a cash outlay, it should be considered a cost if proper accounting procedures are to be followed with regard to the correct source of the landlord's income because, unless opportunity cost is considered, he may be overlooking a chance to make a greater income. Considering all payments made for the use of land (whether as a money cost, cash

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and, in the case of urban land uses, unregulated and unrestricted competition causing industrial slums and poorly planned cities. The need for social control of purely economic motives in utilization of land resources under these conditions is obvious.

[3] The consideration of rent as a cost of production by the individual operator should not be confused with the fact that for society as a whole land rent does not constitute a production cost. From the point of view of society, any payment for the use of land resources is a surplus over supply price, since the supply of land taken in the aggregate is fixed by nature and man cannot change the total amount of land resources in order to secure a price for it. Thus, the elasticity of supply of land in the aggregate can be said to be zero.

rent, or opportunity cost) as a cost of the individual operator helps to determine which operator is to obtain the land for use in producing a given good or service.

If costs of production on two pieces of farm land are identical (that is, if they are equally productive), the one located nearest the market for the product will command the higher rent, due to differences in cost of transportation. The full amount of this difference will be an addition to the economic rent of the better-located farm, and may be referred to as location value. Location value is of particular economic importance in urban land utilization, extremely high rentals being paid for many preferred sites in such cities as New York or Chicago. In other words, in the case of agricultural land, rent is paid in order to save transportation charges, while in the case of urban land, rent is paid in order to secure a larger volume of sales.

Rent as an Unearned Increment. The concept of unearned increment was formulated by John Stuart Mill directly from the Ricardian theory of rent. Ricardo defined rent as ". . . that portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil."[4] The Ricardian theory contends that unequal costs in the production of agricultural commodities, in the face of equal market prices, as set by the highest cost producer, yield differential rents which in capitalized form constitute a source of unearned increment for the owner of more fertile or more advantageously located lands. All other types of income, such as wages, interest, and profits, under a system of private ownership of the means of production, were considered to represent just compensation for actual services, so that only the landowner "grows richer, as it were, in his sleep without working, risking, or economizing."[5] This latter concept grew out of the fact that land is a natural product, the total physical supply of which cannot be increased by man, and has certain indestructible physical qualities, particularly extension and location. Those who own land secure benefits from these differential returns on better-located or more fertile lands, not because of any effort of their own but merely be-

[4] David Ricardo, *Principles of Political Economy and Taxation,* 1st ed., 1819, chap. II.

[5] John Stuart Mill, *Principles of Political Economy, London,* new ed., 1909, p. 18.

cause of the fact that they secured natural advantages through control of ownership rights to these particular pieces of land.

Application of the differential principle adopted by Ricardo to other economic factors reveals the existence of elements of "unearned increment" in virtually all spheres of economic activity. Moreover, land, like capital, is produced, in that it comes into economic use through human activity the same as other production agents do. There are certain very definite costs in producing and utilizing land, as we shall see later in this chapter. It is unsound to argue that increment from differential returns in the utilization of land is unearned, while differential returns accruing in the case of more efficient laborers or managers, and superior grades or types of capital are "earned." It is true that land in its raw state is the creation of nature and, in this sense, original. It is also true that many of the costs of "producing" land are not borne by the owner, but the fact remains that before land is a valuable factor in production, man must make specific contributions to it.

As economic theory has turned from the concept of natural value to that of market value, limitation of the concept of unearned increment to one factor of production (land) has become more and more untenable. Cumulative experience with cyclical price fluctuations has led economists to conclude that under changing market conditions, equal outlays of cost might yield very unequal returns, and that these might accrue to labor, to the entrepreneur, or to the owner of capital, as well as to the owner of land. Thus, all forms of accretions to the real value of people's property which are not foreseen by them or in any degree due to efforts made, intelligence exercised, risks borne, or capital invested by them, also belong in the category of unearned increment.[6] Moreover, in modern times when ownership of agricultural and urban land changes hands more frequently, the buyer of land who pays out of his earnings a price reflecting the capitalized value of the rent secures an income from his land which is no longer unearned increment in the sense in which Mill interpreted it, but rather interest on capital invested.

The treatment of rent as unearned increment led to the formulation of demands for abolishing private ownership of land, which is the source of rent payments, or to methods of socializing rent by taxing the unearned increment 100 per cent. The latter plan would retain private property in land, but would enable the state to appropriate part or all of the economic rent. Henry George's single-tax proposal[7] was advanced as a means of appropriating rent through taxation rather than through nationalization of the land itself.[8]

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[6] Cf. C. R. Bye, *Developments and Issues in the Theory of Rent,* Columbia University Press, 1940, pp. 77-78.

Modern Rent Theory. Where many earlier rent theorists attempted to explain rent as a unique return basically different from returns to the other factors of production and classical doctrine emphasized differing grades of land and differentials measured from extensive and intensive margins, present-day economists stress fundamental demand-supply relationships and the accompanying principles of marginal productivity and opportunity cost common to all production factors. These have been presented in the first section of this chapter; and it will be recalled that although marginal units and marginal costs were used, this was merely to ascertain at what point interaction of total supply and total demand establishes equilibrium, and that in reality all supply and demand units are considered equally important in the pricing process. It can therefore truly be said that the earlier distinctions between price-determined and price-determining factors disappear. This equilibrium sets the price of the product and, with other forces, determines returns to the production agents. Consequently, neither the prices of products nor the prices of production factors are entirely causes or entirely effects; they are, rather, interdependent parts of the whole complex economic process.

The increasing tendency of modern economists to explain rent in terms of fundamental demand-supply relationships through marginal productivity and opportunity cost is a great improvement over earlier rent theories. This use of general value theory rather than of a unique or peculiar principle is probably the most important recent contribution to the unification of distribution theory.[9] The increasing acceptance of this explanation of rent indicates a general respect for consistency of method, and a widespread desire for a single comprehensive principle which can be applied uniformly to all types of income.[10] This should not be interpreted to mean that conditions of supply and demand are exactly the same or operate in precisely the same way in determining land income or rent as in determining labor income or wages, or the other distributive shares in production. It means merely that the same technique or general approach is applicable and that this approach is adequate to reveal conditions of demand and supply peculiar to individual factors of production which necessitate some modification in the application of the principles.

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[7] Henry George, *Progress and Poverty*, author's ed. Wm. M. Hinton, San Francisco, 1879.

[8] Taxation of economic rent is discussed in detail in Chapter XVI.

[9] Cf. Bye, *op. cit.*, p. 106. According to Bye, "The development reaches fruition when rent is included among the cost manifestations of the equilibrium process."

CAPITALIZED RENT AND INCOME DISTRIBUTION

Land secures its value for economic purposes because of the net returns or economic rent it will secure for its owner. In this sense, land has value for the same reasons that any other economic good has value. However, the greater durability of land as a production factor, compared with many freely reproducible goods, results in peculiar emphasis upon future earning capacity of the land for purposes of land valuation. Moreover, because of the lack of standardization among different land units, the relative infrequency of sales of some types and grades of land in many localities, and the disorganized local character of the real-estate market, individual judgment is more influential in the valuation of land than in that of standardized goods in a better-organized market.[11]

Capitalization of Rent into Land Values. The buyer of land is actually buying the right to receive a series of annual incomes, and the most tangible basis for judging what these annual incomes will be in the future is what they have been in the immediate past. Studies show that income received from land for a seven-year or ten-year period preceding sale is a most effective gauge of the price the purchaser will agree to pay.[12] The commonly accepted formula for capitalizing the series of expected annual incomes into land values is $V = \frac{a}{r}$ where "V" is the value of the land, "a" the annual income, and "r" the going rate of interest. The values so determined may be referred to as the capitalized "productivity value" of the land.

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[10] *Loc. cit.*

[11] E. W. Morehouse, "Land Valuation," in *Encyclopædia of the Social Sciences*, vol. IX, p. 137.

[12] *Loc. cit.*

This formula is a reduction of the more complex one which shows algebraically the value of each expected annual increment discounted to present value.[13] In other words, if the annual net return, or economic rent, of a piece of land is $6 per year and the going rate of interest is 6 per cent, the value of the land is $100. This piece of land will yield the same annual net return as $100 placed at interest at 6 per cent will yield during the same length of time. From a strict productivity point of view, therefore, the piece of land is worth $100, or the same as the amount which, at the going rate of interest, would yield $6 annually.

The above formula assumes a constant annual net income or rent from the land, whereas in reality the net income earned fluctuates considerably from year to year or from period to period. Consequently, an element of anticipation may have to be included in the capitalization process. The formula may be altered to include this expectation by adding or subtracting a factor which may be referred to as "*i*," or the amount of expected annual increase or decrease. For example, if the annual net return or rent from a piece of land is expected to increase at a constant arithmetical rate, the formula would be $V = \frac{a}{r} + \frac{i}{r^2}$; whereas if the future net income or rent is expected to decrease at a constant arithmetical rate, $V = \frac{a}{r} - \frac{i}{r^2}$. An extension of this formula has been suggested to make it more applicable to practical conditions, because declines in land rent through soil

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[13] The formula for the present value of a given number of dollars (a) due in n years, if the interest is compounded annually at the rate r, can be determined by the formula $\frac{a}{(1+r)^n}$. This formula is derived from the fact that x dollars compounded at a rate r would be $x(1+r)t$, and if $x(1+r)t = a$, then $x = \frac{a}{(1+r)^t}$. Consequently, if the net income or economic rent of a piece of land is $\$a$, its value could be expressed by the following equation:

$$V = \frac{a}{(1+r)} + \frac{a}{(1+r)^2} + \frac{a}{(1+r)^3} + \frac{a}{(1+r)^4} \cdots \frac{a}{(1+r)^n}$$

The limit of the sum of such a series is $\dfrac{\frac{a}{(1+r)}}{1 - \frac{1}{(1+r)}}$, which reduces to $\frac{a}{r}$, so that the equation showing the succession of expected annual incomes discounted to present value and added reduces to the formula $V = \frac{a}{r}$.

depletion, changes in market conditions, etc., do not usually reach zero:[14]

$$V = \frac{a}{r} + \frac{i}{r^2}\left[1 - \frac{1}{(1+r)^n - 1}\right]$$

In this formula, $n =$ the number of years during which constant increments or decrements occur. In the case of decrements, n means the number of years during which constant annual decreases occur, whether they level out at a positive figure due to shifting the land to some other use, or for some other reason, or to a level at zero or below. At best, however, these formulas can be used in most cases only as rough approximations or guides, because land incomes ordinarily do not increase or decrease at a uniform rate. There will be increases in some years and decreases in others, or alternating increases and decreases, or changes in the rate of increase or decrease, and the formula would have to be changed to fit these conditions. Also, it is necessary to have an excellent system of cost accounting to determine net income or economic rent from land, and to separate the return attributable to land from surplus wages or excess profits from superior management.

The student should not overlook the fact that the preceding formulas also assume a constant interest rate. If the interest rate declines, a piece of land earning the same net return as indicated above—that is, \$6—would be worth considerably more than \$100. In other words, if the interest rate declines from 6 per cent to 3 per cent, the value of the land would double. Mortgage rates of interest in the United States, for example, vary considerably in different parts of the country, and these variations have a significant effect upon the level of land values in these areas.

Disparities Between Land Values and Capitalized Rent. The student should not conclude from the preceding discussion that land values actually found to exist in various areas at different periods will represent strictly the capitalization of the economic rent or net income to be derived from utilization of such lands. There are many reasons why current land values do not correspond more closely to capitalized income values, and only a few will be mentioned briefly here. Institutional forces play an important part in determining land values and lease rates. Custom and tradition frequently result in levels of land values or lease rates considerably above those justified on the basis of economic rent or net income to be secured from utilization of such lands. Richard Jones did not believe that Ricardo's explanation of rents on the basis of economic forces was realistic. Jones observed that peasant rents resulted from causes other than strict capitalization of economic rent, and that competition, being limited by custom, resulted in actual rents and land values different from those which would have been established by purely economic forces.[15] Jones divided rents into two classes—peasant rents and farmers' rents; and he argued that peasant rents are determined solely by a bargain between the proprietor and a set of laborers who are chained to the soil and who use their small capital to get a bare subsistence.

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[14] J. J. Livers and G. H. Craig, "A Note on 'Role of Soil Depletion in Land Valuation,'" in *Journal of Farm Economics*, vol. XXII, no. 4, November 1940, pp. 773 ff.; D. B. Ibach, "The Role of Soil Depletion in Land Valuation," in *Journal of Farm Economics*, vol. XXII, no. 2, May 1940, pp. 460 ff.; and chap. XV give a more detailed discussion of this problem.

Psychological or sentimental values placed upon land, or social prestige which may arise from ownership of particular types or parcels of land, may also determine the level of land values and leases. Many people to whom land ownership brings a sense of security which ownership of other property does not give are willing to pay more for land than the capitalized net return at the going interest rate would justify. In addition, a large number of people believe that since land is created by nature and cannot be reproduced, land values will tend to rise as civilizations mature and growing population increases the demand for products of the land. This causes land values to rise above the level justified by current economic returns.

Regardless of the reasons for existing disparities between land values and capitalized rent, it should be obvious that if the landowner is to secure a reasonable return on his investment, or operate the land with a reasonable profit, he should be cautious about overbidding the capitalized net income value in the price he pays for land. This is true whether the operator is purchasing or renting the land. It can be said, therefore, that economic rent is the most important single factor to consider in appraising the level of values of urban, agricultural, forest, mineral, or any other type of land.

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[15] Richard Jones, *Peasant Rents*, Macmillan, London, 1895; and discussion of Jones' criticism of Ricardo in L. H. Haney, (ed.), *History of Economic Thought*, rev. ed., Macmillan, 1920, pp. 473 ff.

Costs in Utilizing Land. It has been implied that land, while it may be physically free, is not economically free. In other words, land as it occurs in nature is not scarce, but, as a factor of production, land is scarce because various costs in the form of money, work, time, and management are required to expand its economic supply. Urban land is not ready for the home buyer until such improvements as streets, sidewalks, curbs, trees, filling, and drainage have been provided. Except in the case of such extensive uses as grazing or wild hay production, agricultural land improvements must ordinarily be made before the land is ready for man's use. Labor and capital must be expended for clearing, removing stumps, and leveling, draining, or irrigating the land, depending upon its location and character. The cost of clearing cut-over stump lands in the Pacific Northwest, with the latest mechanical equipment, is about $15 per acre merely for removing the stumps. The cost of improvements on dry-land areas through the application of irrigation water frequently exceeds $200 an acre. In addition to these improvements to the land itself, considerable outlay must be made in the form of housing, fencing, and related expenditures.

Uses of land in most American communities change from time to time. In the case of urban land, corner lots formerly used for churches or stores may be used for gas stations or garages. Acres formerly tilled or grazed may be used as a landing field for airplanes. Acres formerly mined may be used for agricultural purposes, and so may cut-over forest lands. Areas of scenic value, formerly used for agriculture, may be devoted exclusively to recreation. Lands often mature or "ripen" into higher or more intense uses. For example, when garages or stores supplant homes, or when rather poor agricultural lands develop into highly valuable recreational areas, the land moves from a lower to a higher use. *Ripening costs* arise from the fact that there is a time element involved in the shifting of land from lower to higher uses. For example, near urban areas, farm lands may be subdivided and advertised for sale as city lots for several years, paying higher taxes assessed on the basis of a suburban valuation. It may be several years later that the land is actually developed and urban houses constructed on it. In many cases, no income whatever is secured from the land during the period in which it is shifting from agricultural to urban use. Numerous examples of such instances may be discovered on the outskirts of practically every growing city.

Similar situations can be cited in the case of forest lands. Rapid deforestation in the United States produced more cut-over land than settlers could take up promptly for agricultural use. Consequently, a period of time elapsed between deforestation and the use of the land for farming, when certain inevitable costs including interest on investment, taxes on the property, and related upkeep charges accumulated.

Costs of shifting land from lower to higher uses are frequently enough to prevent the actual accomplishment of such a shift. These costs may be referred to as *costs of supersession.* A good example is the case of a grain farmer who sees considerable profit possibilities in producing milk and other dairy products, but finds that changing his farm from a grain-producing unit to a dairy farm necessitates such heavy costs as remodeling old buildings or constructing new and adequate ones, purchasing much new equipment, livestock, etc. In urban areas, similar costs of supersession are frequently tremendously large, preventing or postponing the shift from lower to higher use.

It is evident, then, that land as a factor in production is not a free good, and that considerable expenditure of human effort and capital must be made before the land will be useful in combination with other production factors. Even the western homesteads given away by the U. S. government, beginning in 1862, were scarcely a gift of nature, so great were the costs to many settlers in hardship and failure. Even the successful homesteader paid a tremendous price in labor and materials before these lands were brought into a state of productiveness. The free homestead policy of the federal government has been referred to as a program where "Uncle Sam bet the settler he could not last five years." (The settler, under the early free-homestead laws, was required to live on the land five years and make certain improvements before securing title to the land.)

The Future of Rent. Certain forces which may decrease or increase the rents of land in the future should be noted. Changes in dietary habits may cause agricultural rents to decline or to rise, for if people consume less food, decreased demand for foodstuffs will lower agricultural rents. Even a shift in dietary habits from animal and cereal to vegetable and fruit products may tend to reduce agricultural rents, since fewer acres are needed to feed a population which uses more vegetables and fruits and fewer animal products and cereals.

It is impossible to prophesy that either agricultural or urban rents will increase over a long period of time; naturally, agricultural rents will increase only if demand for agricultural products increases more rapidly than the rate at which new agricultural production methods are discovered and effected. Urban rents for business sites will increase only if people concentrate more and more of their buying in a given locality. Improved methods of transportation, which cause population decentralization, and new methods of marketing may offset this tendency. It is true that man has many weapons with which to combat the tendency of returns to diminish; but it is important, nevertheless, to remember that there is an absolute limit on land resources and that the Principle of Diminishing Productivity is always operating.

The student of land economics should remember that changing techniques and methods of utilizing land, as well as methods and practices of distribution and consumption, will change the proportions of the factors used, but not the basic principles which govern these combinations and determine the amount of rent for different grades of land. We live in a dynamic society, not in a static order; and while the principles will apply with equal effectiveness under different conditions, the points representing the most profitable combination of factors will result in different amounts of land being used with a given amount of capital, labor, and management, or vice versa, depending upon costs, production techniques, prices, and related conditions.

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PART THREE

MAJOR LAND USES

CHAPTER SEVEN

AGRICULTURAL LAND

AGRICULTURE uses a larger acreage of the earth's surface than any other major use except forestry, and at least 60 per cent of the world's population (a greater proportion than in any other single occupation) is directly engaged in cultivating the soil.[1] Thus, for the world as a whole, agriculture may be considered the most important land use. However, the importance of agriculture varies considerably among the nations. For example, in the United States, though more than half the total land area is in farms, less than a fourth of the population lives on farms; and the value of agricultural land is estimated to be only approximately three-fifths as great as the value of urban residential land.[2] From the standpoint of employment, agriculture in the United States employs about a fifth of the gainfully employed, while manufacturing and mechanical industries employ nearly a third. In more highly industrialized nations, like England, agriculture is even less important. England produces only about a third of the agricultural products she uses, depending upon imported agricultural goods, paid for by industrial exports, income on investments, and other sources, to feed her population.

Role of Agriculture in the Economy. Agriculture is regarded by many agricultural and industrial leaders as the most important or essential occupation, the keystone of economic and business life, and the highest and most desirable use to which land can be put.[3] This point of view is commonly referred to as "agricultural fundamentalism." Its proponents argue that the importance of agriculture in the economy cannot be measured in terms of the relative proportion of the population or the relative value of the capital (land and improvements) in agricultural production.

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[1] By "agricultural land" is generally meant all land devoted to the production of cultivated plants and domestic animals. Of the approximately 36,000,000,000 acres of land on the earth, slightly over 2,500,000,000 acres, or about 8 per cent, are now cultivated, and an additional 1,344,000,000 acres of arable land is in pasture. Thus, nearly an eighth of the total land area is used for agricultural purposes. Great desert, polar, and mountainous regions unsuitable for agriculture comprise a large part of the earth's surface, the polar regions alone exceeding 16,000,000 square miles, or a twelfth of the earth's surface.

[2] According to Doane, the value of all agricultural land in the United States is about 22 billion dollars, and the value of urban residential land is more than 37 billion dollars. Doane estimates that the value of land devoted to public highways is about 24 billion dollars, or more than the total value of all agricultural land. (R. R. Doane, *The Measurement of American Wealth,* Harper, 1933, p. 199.)

Even in modern nations like the United States, about 20 per cent of the population is engaged in agriculture, and agriculture employs directly some 60 per cent of the total population of the world. It must also be acknowledged that agriculture furnishes an important part of the materials for manufacturing and commerce. Many farm products must be processed and transported to the points of consumption, and many occupations such as transportation, manufacturing, banking, retailing, merchandising, and the professions find their prosperity dependent upon volume and value of agricultural output. Mining and forestry likewise furnish a considerable part of the materials for manufacturing and commerce, but agriculture may be said to produce a more essential type of product than these, in the last analysis, because it produces the foodstuffs necessary to sustain life itself. In some areas, however, the forest products are essential for heating and shelter, and human living at its present level would not be possible in many areas without forestry, or mining. Moreover, for the maintenance of our modern level of living, the automobile manufacturing plants of Detroit are just as fundamental as the cotton fields of the South or the wheat farms of the West. Only when we think of levels of living in terms of the most primitive kind of economy can we conclude that agriculture is strictly the most fundamental enterprise.

In spite of the emphasis which many leaders have placed upon the fundamental nature of agriculture, and in spite of the fact that for the world as a whole more people are today engaged directly in agriculture than in any other occupation, history reveals a trend, most conspicuous in the more advanced nations, toward a smaller place for agriculture in national economies,[4] as invention proceeds and commerce, industry, the arts, and the professions are expanded. This trend has been noticeable since 1850, and more particularly after the First World War. In George Washington's time, three-fourths of the population of the United States lived on farms, while today less than a fourth are farm people. More than half the people (56.5 per cent, according to the 1940 census) live in urban areas (incorporated places with a population of 2500 or more) and the remaining fourth live in villages and towns of less than 2500. In England and Wales, some 78 per cent is urban. Many believe that it is unwise to maintain an unnecessarily large farm population, and that from the standpoint of long-time maximum satisfaction of human wants, it is desirable to devote the smallest possible proportion of total national energy to providing for the essential wants of food, shelter, and clothing. In this way, a maximum is available for leisure activities and for satisfying human wants for the wholesome non-essentials.[5]

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[3] For numerous citations from addresses and writings of many agricultural leaders in regard to the fundamental character of agriculture, see J. S. Davis, *On Agricultural Policy, 1926–1938,* Food Research Institute, Stanford University Press, 1939, chap. II.

[4] This trend seems so pronounced that Davis ventures to state, as a law of economic history, "Economic progress, broadly viewed, tends to be accompanied by a decline in the relative importance of agriculture." (*Ibid.,* p. 27.)

The recent decline in many farm populations, and a corresponding decline in the relative importance of agriculture in national economies, have given rise to a fear on the part of many that the food supply will be inadequate, or that because agriculture is disintegrating, civilization itself is disintegrating. Large agricultural surpluses in the United States, Canada, and other large exporting nations should tend to alleviate any fears regarding the inability of the world's farming population to produce an ample food supply. However, the fears that declining farm population may mean declining civilization, since farm areas are the source of urban populations, are not so easily disposed of. It is true that birth rates are highest in rural areas, and it is true that rural areas have supplied urban areas with young people and enabled cities to increase in population or maintain themselves. The seriousness of a declining birth rate accompanying an increase in urbanization depends upon the efforts and adjustments made to meet the impacts of declining population on the economy. Ignoring the argument that the farm is the place to raise the healthiest young people, there is still the argument that a nation may experience serious internal maladjustments unless it plans carefully for the effects of a declining population. The pressures, real or imagined, which arise because all nations do not experience the same population trends at the same time, are an important cause of modern warfare.

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[5] See the author's treatment in "On Agricultural Policy," *Journal of Farm Economics*, May, 1940, pp. 484–492, a critical review of Davis's book, *On Agricultural Policy*.

Increased impersonalization is also associated with declining farm population and increased urbanization. Agricultural communities are areas of primary group relationships, where the predominantly personal associations and dealings make local controls and social bonds stronger; while in modern urban areas human relationships are highly impersonalized and economic relationships tend toward monopolistic combinations and imperfect competition, resulting in serious maladjustments. Since primary group relationships characteristic of farm communities are an essential counterpart of democratic, more freely competitive societies, many feel that the declining importance of agriculture has grave implications for the future of such societies.

THE SUPPLY OF AGRICULTURAL LAND

Agriculture must compete successfully for the use of land with other major uses. Ordinarily, forestry is considered a lower use of land than agriculture. Nevertheless, in some national reforestation programs, agricultural land is frequently taken for reforestation, because until reforestation is undertaken, the land is continued in agricultural production and contributes to the total agricultural output, although it may be submarginal for farming. Agricultural land is continually being drawn upon for expanding urban, recreational, mining, and transportation uses. Less than three-fifths (58 per cent) of the total arable land of the earth is used either for crops or pasture. Thus, the economic supply of land for agriculture, viewed from the standpoint of area or acreage, could almost be doubled. Whether this acreage will ever be utilized for agricultural production depends upon the relative profitableness of agriculture compared with other possible uses of the land.

Physical Factors Determining Suitability of Land for Agriculture. In general, physical factors are more strategic in agricultural land utilization than in utilization of land for other purposes; furthermore, within the field of agriculture, physical factors limit the use of land for crops more than for pasture.[6] Soil characteristics, topography, moisture, temperature, and location determine the areas that are suitable for agriculture and the practices that will be most effective in utilizing them. Within the limits established by these physical factors, human choices determined by economic, social, and related forces determine the type and intensity of use.

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[6] Crop plants are ordinarily of greater annual value than pasture plants and require more favorable physical conditions and more careful attention and husbandry than pasture plants. The moisture and temperature requirements of

Soil Characteristics. Although the general soil pattern is determined by nature, the physical make-up of the soil can be changed somewhat by man's land utilization practices. Heavy, clay soils lack organic matter, whereas wet, acid soils require lime, and greater yields can be obtained from almost every type of soil by adding certain types of fertilizer, or other mineral elements. Some plants chiefly utilize space below the surface of the soil, while others grow above the surface. Soils must contain adequate amounts of nutrients essential for plant life, particularly nitrogen, phosphorus; and potash, and have desirable texture, structure, and chemical reaction to produce abundant crops and plant growth. Though some crops require special soils, generally speaking, soils containing more finely divided soil particles and a large quantity of organic matter can furnish more plant nourishment and, consequently, sustain more plant life. Thus, character of the soil is frequently the most important determinant of success or failure for a farming enterprise.

The soil may be considered a perpetual "storehouse of life," or factory, which with proper care can be made to produce a large amount of foods and fibers for an indefinite time. With proper care, the soil can be a self-renewable or revolving fund, with a permanent flow of products from it or from its use. Agriculture, properly operated, is not an extractive industry, for soil fertility can be improved as well as preserved, generation after generation.

Topography. Successful agriculture requires a certain amount of levelness as well as suitable soil. Soils do not develop on slopes as they do on level land, because less water is available. In some places, man has increased the economic supply of land for crop production by himself leveling the land. This is frequently done on irrigation projects. Terracing, a form of leveling, has been practiced for

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crop plants restrict them to a smaller part of the earth's surface. Moreover, crop plants cannot very well be grown on stony lands where plowing and cultivation are difficult, nor can they be grown permanently on steep slopes where cultivation contributes to serious erosion. (For a more detailed comparison of crop plants and pasture plants, see O. E. Baker, "A Graphic Summary of Physical Features and Land Utilization in the United States," U. S. Department of Agriculture, Miscellaneous Publication 260, pp. 19–22.)

those with ten to twenty inches as *semi-arid,* those with twenty to many centuries in parts of Europe and Asia to bring steep slopes under cultivation and thus make them part of the economic supply. In general, however, unless man develops certain adaptation techniques, land which has over fifteen feet of fall in a hundred should not be used for crops.[7]

Not only degree of slope, but direction of slope—that is, whether it is in a southerly or northerly direction—is frequently important in using land for certain crops because of associated sunlight and temperature conditions. For example, a northerly slope where the land is less completely exposed to the direct rays of the sun for a major portion of the day is considered preferable to a slope in a southerly direction for fruit trees particularly susceptible to freeze damage. On very sunny slopes the sap may flow very early in the spring or relatively late in the fall and increase the possibilities of freeze damage from late spring or early fall low temperatures.

Man can improve or reduce soil fertility more effectively and on a larger scale than he can change topography. Only for certain uses requiring relatively small land areas can man change topography sufficiently to adjust the surface formation nearer to his needs. In Figure 17, showing topographic features of the land area of the United States, the mountainous areas stand out clearly. Note the rough, high character of the West and the relatively level surface of the Mississippi Valley except for the Ozark area in the lower central portion.

Moisture. Plants require water as well as plant nutrients. To man, therefore, the amount of moisture is a very important feature of the natural environment. Moisture is made available through the natural process known as the *hydrologic cycle.* In this cycle, moisture from the parent seas evaporates and is absorbed into the air in the form of water vapor. This water vapor is transported over the land by the winds, condensed and precipitated onto the land, and is subsequently returned to the air through evaporation, or to the seas through streams and rivers (see Figure 18).

Some areas of the earth have abundant water supplies for all purposes, in which case water is considered a free good. In other areas, water is relatively scarce and various techniques of conserving and utilizing it have been developed. Total precipitation helps to determine type and amount of plant growth; and distribution throughout

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[7] O. E. Baker, "Land Utilization in the United States: Geographical Aspects of the Problem," *American Geographical Review,* vol. XIII, no. 1, January 1923, p. 17.

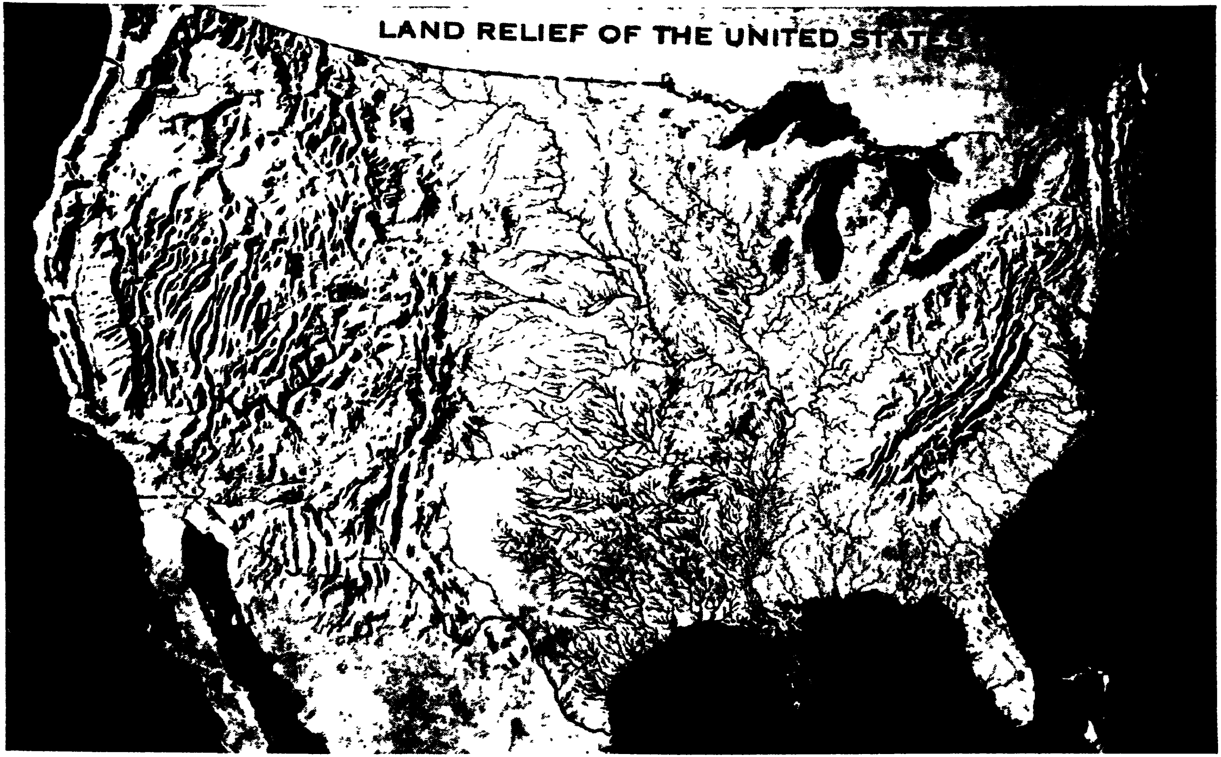


FIGURE 17. Land Relief, or Topographic Features of the United States. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

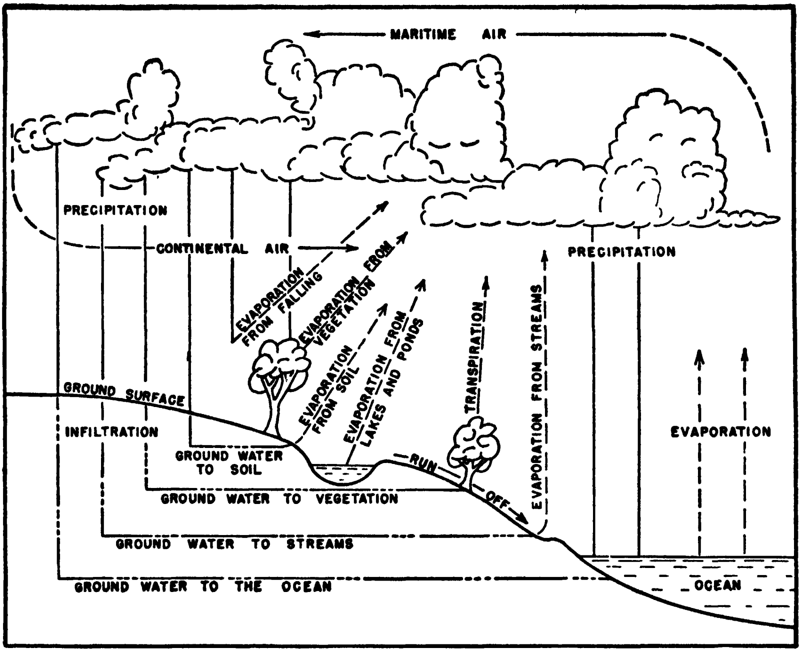


FIGURE 18. The Hydrologic Cycle. (Adapted from U. S. Department of Agriculture Yearbook, *Climate and Man,* Government Printing Office, Washington, 1941.)

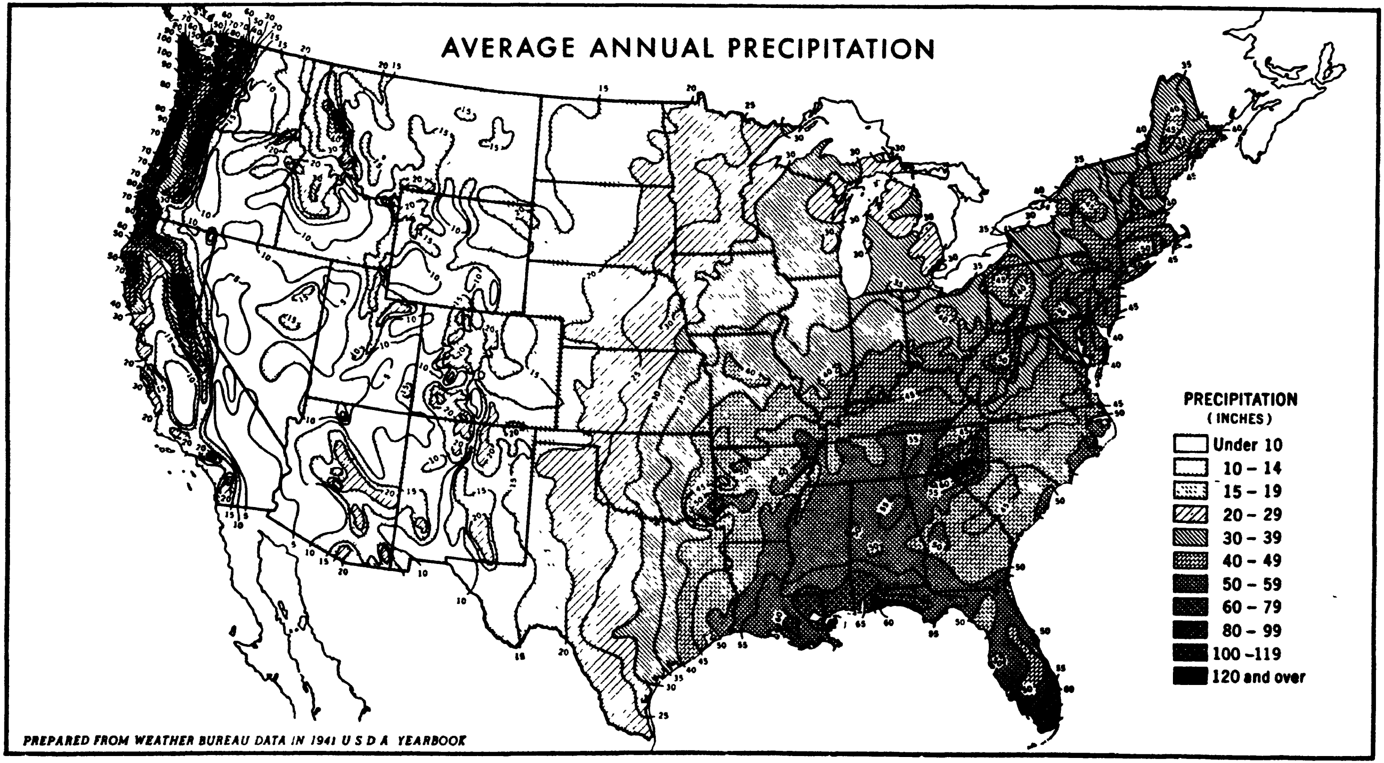
the year, rate of evaporation, nature of soil and underlying parent material, and form in which the precipitation occurs greatly influence the efficiency of the moisture. For example, rainfall during the growing season is much more effective in determining plant growth in a given season than a similar amount of rainfall in the winter months. A slow, steady rain is more effective for plant growth than a short downpour in which runoff is high. If the soil is heavy and the surface crusted and hard, runoff is much greater than where the soil is porous and light with a soft, cultivated surface. Cool, cloudy weather following a rain results in much less loss through evaporation than hot, sunny weather and strong winds.

Although the effectiveness of precipitation cannot be measured simply in terms of the total number of inches annually, classification of areas in terms of inches of average annual precipitation does help to indicate their suitability for agriculture. Areas with less than ten inches of average annual rainfall are ordinarily classed as *arid,* thirty inches as *subhumid,* and those with more than 30 inches as *humid.* It has been estimated that approximately a fourth of the earth's surface falls into the arid classification, while another 30 per cent is classed as semi-arid, and 10 per cent humid. Areas with less than ten inches of moisture yearly cannot be used for successful crop production, because of limited grass growth which will support only light grazing. In areas receiving from ten to twenty inches of rainfall, certain adaptations must be made by man through alternate summer-fallow and cropping practices, or development of drought-resistant varieties, and special tillage practices to secure successful crops. If the evaporation rate is high, operators must modify their agriculture in areas which have as much as twenty or thirty inches of annual precipitation to insure successful crop production. Such areas will raise grass, and range livestock enterprises will usually be developed on them. More than half the earth's surface is arid, semi-arid, or subject to a scarcity of moisture to which its agriculture must be adjusted.[8]

In the arid and semi-arid regions where plants use almost all the moisture that soaks into the ground, variations of a few inches in rainfall will mean the difference between a good crop and a complete failure While man cannot change the amount or the time of rainfall, he can make arid and semi-arid lands part of the economic supply of land for agriculture, by developing drought-resistant species of plants, bringing moisture to the soil by irrigation, or developing tillage practices such as the alternate crop and summer-fallow method, in which a crop is raised once every two years, and the moisture of the year when the land is not cropped is conserved by tillage and made available for the year in which the crop is grown. He can also test subsurface conditions at planting time and plant only when moisture content appears adequate to insure a satisfactory crop or justify expense of seeding.

Irrigation is widely practiced in the arid and semi-arid regions, in areas of intensive truck and fruit farming, in humid regions where rainfall is irregular, and even, for certain crops, in areas where rainfall is fairly abundant—for example, in the rice fields of India and

[8] J. A. Widtsoe, *Dry Farming,* Macmillan, 1911, p. 24. Griffith Taylor, in "The Frontiers of Settlement in Australia," in the *American Geographical Review* for January 1926, indicates that the following proportions of continental land surfaces are classified as having less than twenty inches of annual precipitation: Australia, 66 per cent; Africa, 54 per cent; Asia, 67 per cent; North America, 52 per cent; Europe, 47 per cent; and South America, 16 per cent.



PREPARED FROM WEATHER BUREAU DATA IN 1941 U S D A YEARBOOK

FIGURE 19. Average Annual Precipitation in the United States. Precipitation includes rain, melted snow, sleet, and hale. (Source U. S. Department of Agriculture, Bureau of Agricultural Economics.)

China. Whenever irrigation water is made available to new land, or whenever the yield is enlarged by applying water to land already used, the economic supply of agricultural land is increased. Possibilities of extending the economic supply of agricultural land through irrigation, however, are limited by the availability of water supplies and by the type of land available. There must be fertile, level land with good drainage and a water supply not only readily accessible but reliable and adequate, if the additional costs of irrigating are to be met and the land is to be an effective part of the economic supply.

Figure 19 shows the average annual precipitation of the United States. Note the arid and semi-arid areas in the West, the high rainfall belt along the Pacific Coast, and the generally humid conditions of the eastern half of the nation.

Temperature and Sunshine. The correlation between the temperature of an area and the amount of sunshine it receives is so close that the two terms are often confused or used interchangeably. Although a certain amount of heat is given off by the earth, the sun is the major heat source for the world's atmosphere. The heating effect of the sun's rays on the earth is called *insolation,* and varies from place to place according to the angle at which the rays strike the earth and the length of time the sun shines. Temperature and sunshine affect man's activities indirectly, by determining plant growth and production of food and fiber from the soil, and directly, through the effect of different climates upon his activity and enterprise.

Temperature and sunshine have different functions in plant growth. Plants require a certain external temperature to carry on their life processes, some plants growing at temperatures just above freezing, while others require comparatively high temperatures. Temperature of soil and air largely limits the plants man may grow, and the temperature of the sea limits the marine life he may exploit. The length of time during which a certain average or range of temperature is available is also important if plants are to mature. Temperature conditions of an area are usually measured in terms of average frost-free period and number of heat units during this or a shorter period.[9]

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[9] The number of heat units during a day is the average temperature of the day minus a certain constant which is assumed to be the minimum temperature at which general plant growth takes place. This has been tentatively set by

The radiation of the sun's rays supplies the actual energy for the life processes of plants; and the more radiation, the faster a plant will grow. In tropical regions, the days are almost the same length during all seasons; but as one moves north or south from the tropics, a seasonal variation occurs in length of day, and therefore in amount of sunlight available for plants during that season. For example, in the interior of Alaska, where the growing season is less than sixty days long, there are between eighteen and twenty hours of sunshine a day, which permits the growing of wheat. Sunshine becomes an increasingly limiting factor as one progresses northward or southward from the tropics and temperate regions.

Roughly, mean temperatures of from 50° to 70° are considered temperate, and those above 70° or 80°, tropical. A mean temperature of 50° or below for four or more months strictly limits the variety of crops which can be grown successfully. Any region having a mean temperature of 50° or lower for the warmest month is beyond the limit of successful cereal production, and marks the poleward limit of permanent human occupation, except for a few Eskimos and Lapps.[10]

Certain crops have strict requirements which must be met and which definitely limit the economic supply of land for their use. For example, corn is not raised in important amounts in the United States except where the mean summer temperature is between 70° and 80° F., the mean night temperature during the summer above 58° F., and at least 140 consecutive days are free from frost.[11] In contrast, wheat may be profitably raised under much less exacting temperature conditions. Wheat will stand a cooler and shorter summer, requiring only about three months of frost-free period. This accounts for the fact that wheat is the world's most common bread grain, raised in almost every nation in the world, while the areas in which corn can be successfully produced are strictly limited.

Figure 20 shows the average length of frost-free season for the United States. Note the short frost-free season in the high altitude area of the west and the most northern sections. Although areas along both coasts and in the south have comparatively long grow-

some workers at 43° F. (N. W. Johnson and M. H. Saunderson, Montana Agricultural Experiment Station Bulletin 328, p. 19.)

[10] L. E. Klimm, O. P. Starkey and N. F. Hall, *Introductory Economic Geography*, Harcourt, Brace, 1937, p. 72.

[11] *Ibid.*, p. 71.

ing seasons, no portion of the United States is entirely free from frost.

Although temperature conditions cannot be changed, crops can be adapted to them, to a limited extent. The breeding of plant varieties adapted to certain temperature conditions increases the economic supply of land for some crops. Where the demand is sufficiently great for plants which will not grow under existing temperature conditions, greenhouses may be used to supply heat requirements and protect the plant from outside temperatures. This method is very expensive, however, and the increase in supply of agricultural land by this method is usually restricted to the production of flowers, tomatoes, plants for early transplanting, certain vegetables, and special fruits.

Location or Situation. Since land is fixed and immobile, no particular parcel of land is, in a strict physical sense, any more mobile or adaptable for human use than any other. However the choices of society differentiate locations on the basis of usefulness in want-satisfaction, location of agricultural land in relation to concentrations of people is usually of less importance than the four physical characteristics of soil, topography, moisture, and temperature, because man, through modern technology, has greatly reduced the economic significance of physical space and distance. In some special cases, however, because of a combination of circumstances, location may be of major significance in determining use of the land for agriculture.

Amount of Land Suitable for Agriculture. The total area of the earth is about 197,000,000 square miles, of which the land surface (excluding oceans and similar bodies of water, but including inland streams) is about 55,000,000 square miles, or nearly 36,000,000,000 acres. The water area of the earth in the form of oceans, seas, gulfs, and similar large bodies of water, comprises some 142,000,000 square miles. In other words, land surface makes up a little over a fourth of the total, and areas covered by water, nearly three-fourths. Nearly a third of the land area of the earth is in Asia, almost a fourth in Africa (approximately 55 per cent of the total is contained in these two continents), slightly more than a sixth in North America, about a seventh in South America, and less than a twelfth each in Europe and Oceania.

Soils, topography, moisture, and temperature determine the absolute limits of cultivability or physical productivity, and consequently

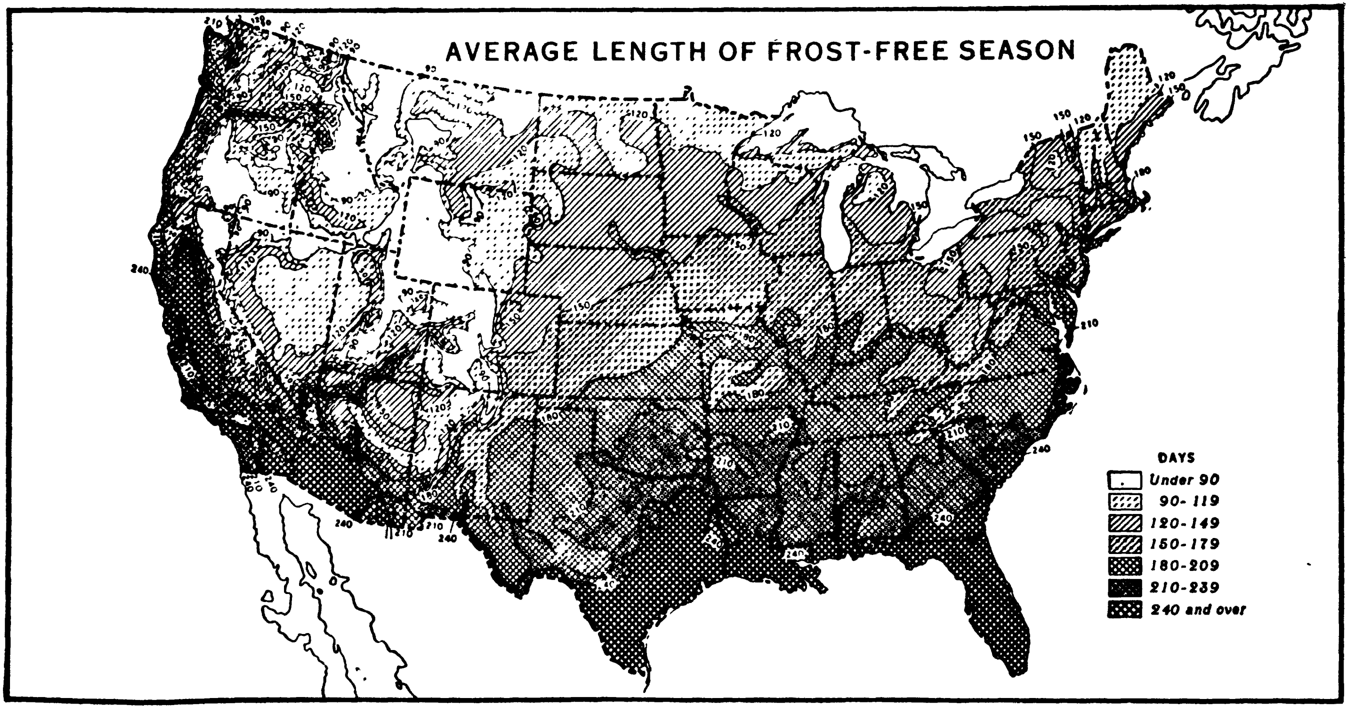

FIGURE 20. Average Length of Frost-Free Season in the United States. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

the potential economic supply of land for agriculture. Thus, the total physical area of the earth suitable for crop production must meet certain requirements under each of these conditions. Areas which are too dry, too cold, or too mountainous or rough for crops can be quite readily determined, because there are definite physical limits for each of these three factors, beyond which successful crop production cannot occur. However, in the case of soil conditions, no such definite physical limits can be established. Some soils are too stony, too lacking in plant nutrients, too acid, or too alkaline to permit successful production of certain crops; but almost any soil located in an area that is not too cold, too dry, or too mountainous or rough for successful crop production can grow some crop plants. Whether or not such soils will be utilized depends, of course, upon the profit possibilities.

Of the approximately 55,000,000 square miles or 36,000,000,000 acres of land area on the earth, about 30 per cent is too dry for crops; an additional eighth is too cold; and another twelfth is too rough or mountainous; thus, slightly over half (approximately 50.5 per cent) of the total land area of the earth is unsuitable for crops.[12]

Figure 21 shows the distribution of these dry, cold, and mountainous areas unsuitable for crop production among the continents of the world. Note that some areas are too dry, others too cold, others too rough, others too dry and too cold, and still others too dry, too cold, and too rough. Note the relatively large areas too dry for crops without irrigation in the continents of Africa, Asia, and Australia; and note also the comparatively large areas in northern Asia and northern North America that are too cold. The areas in the Figure not indicated as too dry, too cold, or too mountainous for crops are not all necessarily arable. Many of these areas are too stony, or have soil conditions or geographical formations which make cultivation impossible, or so difficult as to be physically impracticable. For example, the Laurentian Shield in northern Canada is suitable for crop production, from the standpoint of temperature, moisture, and topographic requirements, but entirely unsuitable from the standpoint of soil requirements. It has been estimated that approximately a fifth of the total land area of the world (some 10,000,000 square miles, or about 6,500,000,000 acres) is arable, or

[12] O. E. Baker, "Land Utilization in the United States," and "The Potential Supply of Wheat," *Economic Geography*, vol. I, no. 1, March, 1925. Baker lists 52,000,000 square miles as the land surface of the earth, compared with 55,885,000 given in the Rand McNally *Commercial Atlas*, 1931.

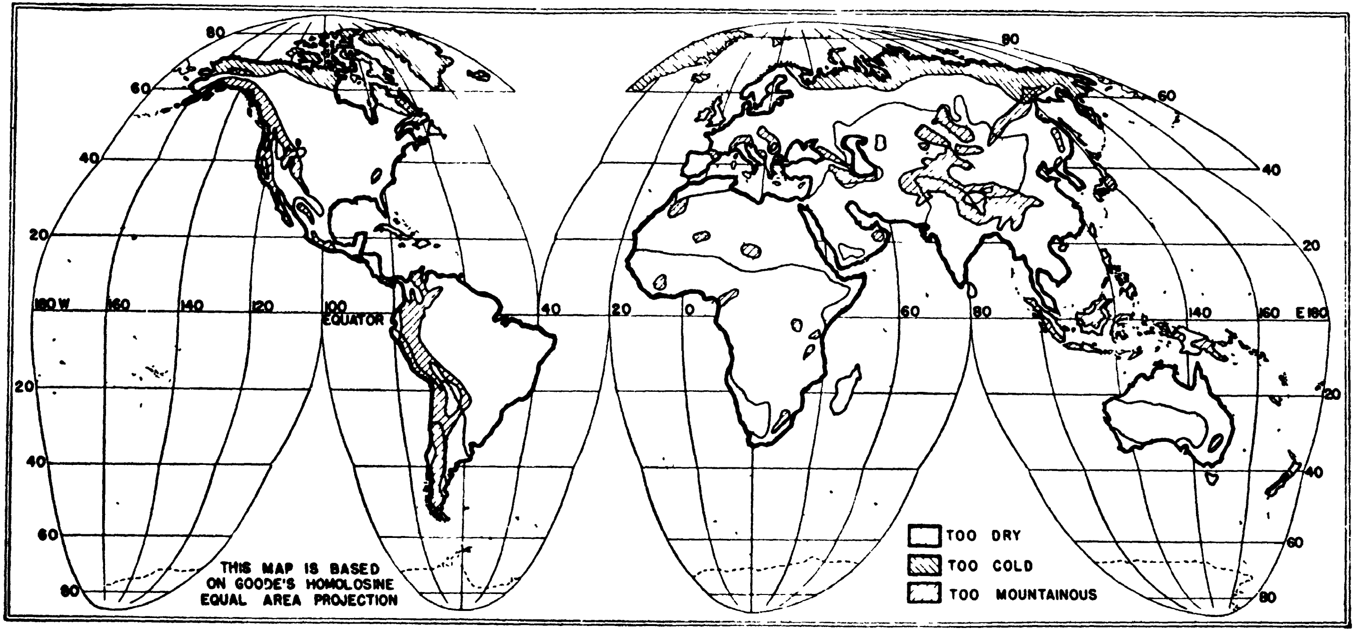

Figure 21. Areas Unsuitable for Tillage, by Continents. Areas considered too cold if no month is as warm as 50° Fahrenheit; too dry if annual precipitation is less than ten inches. Mountainous areas are adapted from Wellington D. Jones and Derwent S. Whittlesey, *An Introduction to Economic Geography*, University of Chicago Press, 1925. The areas shown on the map are conservative estimates of the limit of cultivation. Present cultivation has by no means reached these limits. (Map prepared by N. Helburn.)

ultimately arable. Many areas indicated in Figure 21 as unsuitable for crops are suitable for pasture, and can be used for livestock grazing.

In the United States, approximately half (973,000,000 acres) of the land area of 1,903,000,000 acres is physically suited (without irrigation and drainage) for crop production.[13] Of the rest, 468,000,000 acres are arid grazing lands unsuited for any other purpose. Land in forests fit only for forestry with incidental grazing comprises an area of 262,000,000 acres, while some 66,000,000 acres not at present in forest is fit for pasture or forests, but not for crops. Some 67,000,000 acres are waste land (chiefly desert and rock) unfitted for crops, grazing, or forests.[14] This acreage, with the remainder of about 67,000,000 acres, will be used in part for cities, towns, roads, airports, railroads, homesteads, recreation, mining (which ordinarily uses more subsurface than surface areas), and other purposes.

Only a tenth, or 101,000,000 acres of the 973,000,000 acres of U. S. land suitable for crop production without irrigation and drainage, is classified as excellent or Grade I land for the staple crops on the basis of soils, topography, precipitation, and temperature; a fifth, or 211,000,000 acres, is classified as good (Grade II); 346,000,000 acres, or 35.6 per cent, as fair (Grade III); and 363,000,000, or 37.3 per cent, as poor (Grade IV).[15] About three-fourths of the Grade I land is located in the corn belt. One-third of the good, or Grade II, land is located in the states from Texas to North Dakota, almost wholly in the grassland portions. Land of fair fertility (Grade IIII) is found in nearly all the states, but half is located in the South. Nearly half (43 per cent) of the poor land (Grade IV) is located in the southern states, and nearly three-fourths of the nontillable land, or 882,000,000 acres, is located in the eleven far western states. These acreages are very tentative estimates, because an accurate inventory of United States lands according to physical productivity can be made only upon completion of scientific soil surveys which, as was noted in Chapter II, have been made for less than half the total area of the country.

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[13] *Ibid.*, p. 20. It has been estimated that only about 75,000,000 acres can be added by drainage and 30,000,000 acres by irrigation. See Joint Committee on Bases of Sound Land Policy, *What About the Year 2000?* Federated Societies on Planning and Parks, Washington, D. C., 1929, pp. 21–22.

[14] *Ibid.*, p. 22.

[15] National Resources Planning Board, *Report to the President of the United States*, December 1, 1934, Government Printing Office; and O. E. Baker, "A Graphic Summary of Physical Features and Land Utilization in the United States," pp. 12–14.

TYPES OF FARMING

In discussing agricultural land utilization and the economic problems of farming, most people think in terms of the type of agriculture with which they are most familiar. There are many types or systems of farming, and the type which is used will determine to a large extent the amount of land and the practices followed in utilizing it within a given farm.

In the United States, the census lists all land in farms as farm acreage, although this land in farms includes in addition to cropland harvested, acres upon which crops were planted but failed, cropland which is lying idle or fallow, plowable pasture, pasture which is not plowable, and all woodland. In other words, all farm woodlots are included in farm acreage, and are generally included in the figures showing the acreage of agricultural land. On the other hand, some of the area not included in the land in farms is used for farming—such, for example, as very small tracts in gardens in urban areas.[16] Only about two-fifths of the land in farms in the United States is actually used for cultivated crops (approximately 400,000,000 out of more than 1,060,000,000 acres), and about half the land in farms is devoted to pasture; the remainder or about a tenth of the land in farms is in the form of farm woodlots, and in reality should be classed as forest land rather than agricultural.

Perhaps the most important bases upon which types of farming can be classified are the motives for farming.[17] It is frequently said

[16] The U. S. Census enumerators report as land in farms all tracts above three acres, or smaller tracts, if they produce at least $250 worth of products. Consequently, small gardens of urban dwellers which produce only a small amount of produce and cover only a few square feet would not be included, although in the aggregate they amount to many thousand acres and produce a large amount of agricultural products. Likewise, the production of agricultural commodities with artificial methods such as greenhouses, while individually covering very little area and not ordinarily considered as agricultural land, nevertheless contributes significantly in the aggregate to the agricultural output.

[17] Gray lists twelve bases for classifying systems or types of farming, as follows: (1) characteristics of natural resources, (2) kind of enterprises, (3) variety of enterprises, (4) kind of field system, (5) size or scale of operation, (6) proportion of labor and capital to land, (7) kind of power used, (8) effect on soil resources of the type of farming, (9) character of business organization, (10) tenure of operator, (11) kind of labor, and (12) motives of farming. (L. C. Gray, *Introduction to Agricultural Economics*, Macmillan, 1924, pp. 7–8.)

that farming is a way of life, and that people farm not merely to make money, but as a desirable way of living. If a family farms primarily because they like to live in the country and to work with plants and animals and with the soil, their land use practices will probably be very much different from those of an operator whose primary motive is to make as much profit as possible from his operations. If farming is undertaken on the basis of securing enough products to feed the family rather than to produce goods for sale or profit, the operator will be interested primarily in securing the greatest amount of certain products from his labor regardless of the prices or costs of the various factors of production. In part-time farming, where the major motive is to produce some agricultural commodities for the use of the family, or for sale, but in which the agricultural activities are incidental to the main job which the head of the family has in an industry nearby, the combination of the factors of production with land will be very much different from those on a commercial producing unit. In other words, the main motive for farming determines to a large extent the methods which will be used in operating the land and the proportions of labor, capital, and management which will be applied to a given area of land.

Self-Sufficing vs. Commercial Agriculture. In a strict sense, self-sufficing agriculture means producing on the farm all the necessary goods and services required by the family. The U. S. Census classifies farms as self-sufficing when the value of farm products used by the operator's family is 50 per cent or more of the total value of all products produced on the farm. In pioneer areas located long distances from markets, or in which transportation or other difficulties make marketing costs excessive, farming tends to be of the self-sufficing type. In the settlement of the United States, pioneer farmers who pushed farthest west from the Atlantic seaboard into the Ohio Valley and on toward the Mississippi largely followed a self-sufficing type of farming. By hunting, the pioneer was able to secure much of his food supply in the form of meat animals, and hides for clothing. The family did its own spinning and weaving of cloth from the wool or flax which it produced, but even so, there were certain products which the pioneer family needed which it could not produce, such as kitchen utensils, gunpowder, salt, and condiments. In more primitive areas, particularly in internal Asia, the agriculture followed by some peoples is entirely self-sufficing—that is, nothing is bought or used aside from that which they produce themselves.

When markets develop for products which the farm family may be able to produce, self-sufficing agriculture begins to be replaced by commercial agriculture. There are various degrees of commercialism in farming, but when the farm family produces some products for sale to secure funds with which to purchase other necessary goods or services which it cannot supply from the farm, it is no longer a strictly self-sufficing farm. On this basis, there is very little strictly self-sufficing agriculture in the United States or in other recently settled agricultural areas. Southern agriculture in the United States was on a commercial basis from the beginning, because a ready market was available for its tobacco and cotton. This highly commercialized character of southern agriculture was an important factor creating the serious economic difficulties in which the South found itself at the outbreak of the Civil War. Southern plantation owners sold their cotton and tobacco in an unprotected world market in England, but had to purchase the products they needed in a protected domestic market at an entirely different price level. This selling in an unprotected market and buying in a protected one was an important factor contributing to the economic distress of southern agriculture, not only prior to the Civil War but until recent years, when governmental programs have been designed to secure benefits for southern farmers.[18]

During severe business depressions, when the commercial farmer finds his prices declining heavily without any corresponding decline in his overhead costs, a system of self-sufficing or "subsistence" farming is advocated by many as the solution. However, the proponents of commercial argiculture argue that commercial farming enables the farm operator to take advantage of the principle of specialization or division of labor and enable a higher level of living to be secured by farm people as well as urban folks, through the greater productiveness resulting from specialization. Such proponents argue that the solution to the farm problem is not a return to self-sufficing or subsistence farming, but rather a removal of the forces in the economy which create violent price changes, or adoption of governmental or other programs which will compensate for these price changes.

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[18] The AAA program inaugurated by the New Deal in 1933 was an attempt to secure parity prices for agricultural products. Cotton and tobacco, two of the South's most important farm products, were included in this parity price program, "parity price" meaning that farmers would secure prices for their products which bore the same relationship to prices of things farmers must purchase as the relationship which existed between these two types of goods in a given base period (1910–1914, in the case of most products under the AAA program).

In modern societies, proposals to have farmers follow a type of agriculture largely self-sufficient in character are not generally popular. This type of program not only is in opposition to the recognized principles of comparative advantage and specialization, but it is a difficult program to pursue in many areas, because of climatic, topographical, soil, or other limitations. American farmers have looked upon a strictly self-sufficing type of farming as "peasant" agriculture, characteristic of the older nations of Europe where farmers have operated relatively small units, largely with hand labor, and have been able to secure only a relatively low level of living. Chinese agriculture also is largely of a self-sufficing or subsistence type. American farmers have insisted upon following a combination of enterprises and practices which would enable them to attain a higher standard of living than that achieved through this peasant type of farming.

General or Diversified Farming. General farming ordinarily refers to a type of highly diversified agriculture in which, although the farmer produces a great variety of products, both of crops and of livestock, he nevertheless produces a considerable amount of products for sale, and is not on a strictly self-sufficing basis.

For various reasons, the principle of diversification, or not putting all of one's eggs in one basket, has been widely followed, even though it may seemingly be in opposition to the principle of specialization or comparative advantage. The most important reason for diversified agriculture is that it has been necessary in most areas in order to permit a balanced labor load through the year for the farm operator and his family, and the use of a system of crop rotations combined with livestock enterprises to maintain or improve soil fertility.

For American agriculture as a whole, general farming is predominant. It is generally considered a comparatively efficient means of production. Moreover, the areas in which general diversified farming has been practiced are mostly those in which soil erosion and fertility wastage have been least. The two major agricultural problem areas in the United States are the South, where a one-crop system of cotton production has predominated, and the Great Plains area, where dry-land wheat production has predominated. General or diversified farming is a fairly intensive type of land use, because a comparatively large amount of labor is utilized with a given area of land. Moreover, the investment in capital in the form of machinery is relatively large, because the great variety of enterprises requires many different types of machinery. In some areas, farmers have grouped together to use cooperatively certain types of the larger, more expensive machines, so that the same amount of capital is spread over a larger land area.

Part-Time Farming. In addition to self-sufficing, specialized, and general farms in the United States, there are also part-time farms. In this type of agriculture, the family lives on a farm; the operator or head of the family works part of the time elsewhere, for wages or a salary.

Part-time farming is greatest in areas where population centers are close enough to make commuting to and from employment practicable. Part-time farming is considered especially desirable by industrial and agricultural leaders who believe that industry should decentralize. During the early thirties, the federal government embarked upon a subsistence-homestead program designed to give stranded or migatory families an opportunity to live on a few acres of land and secure part-time work in a neighboring town or industrial area.[19]

Types of Farming in the United States. The United States may be divided agriculturally into two parts—the East and the West—on the basis of whether the land is chiefly used for crops or pasture. The dividing line is close to the 100th meridian, the area east of this line having a subhumid or humid climate, and the area west of it having an arid or semi-arid climate except in parts of the Columbia Plateau, the Pacific Coast area, and at the higher altitudes in the mountains (refer to Figure 19). The East is divided into eight regions, excluding the forest and hay belt, on the basis of the dominance of a certain crop or type of farming, the result primarily

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[19] M. L. Wilson, "The Place of Subsistence Homesteads in Our National Economy," *Journal of Farm Economics*, vol. XVI, no. 1, January 1934, p. 73; and W. W. Wilcox, "Planning a Subsistence Homestead," U. S. Department of Agriculture, *Farmers Bulletin, 1933,* April 1940. For an analysis of recent studies of part-time farming, see L. A. Salter, Jr., and Larry F. Diehl, "Part-time Farming Research," in *Journal of Farm Economics*, vol. XXII, no. 3, August 1940.

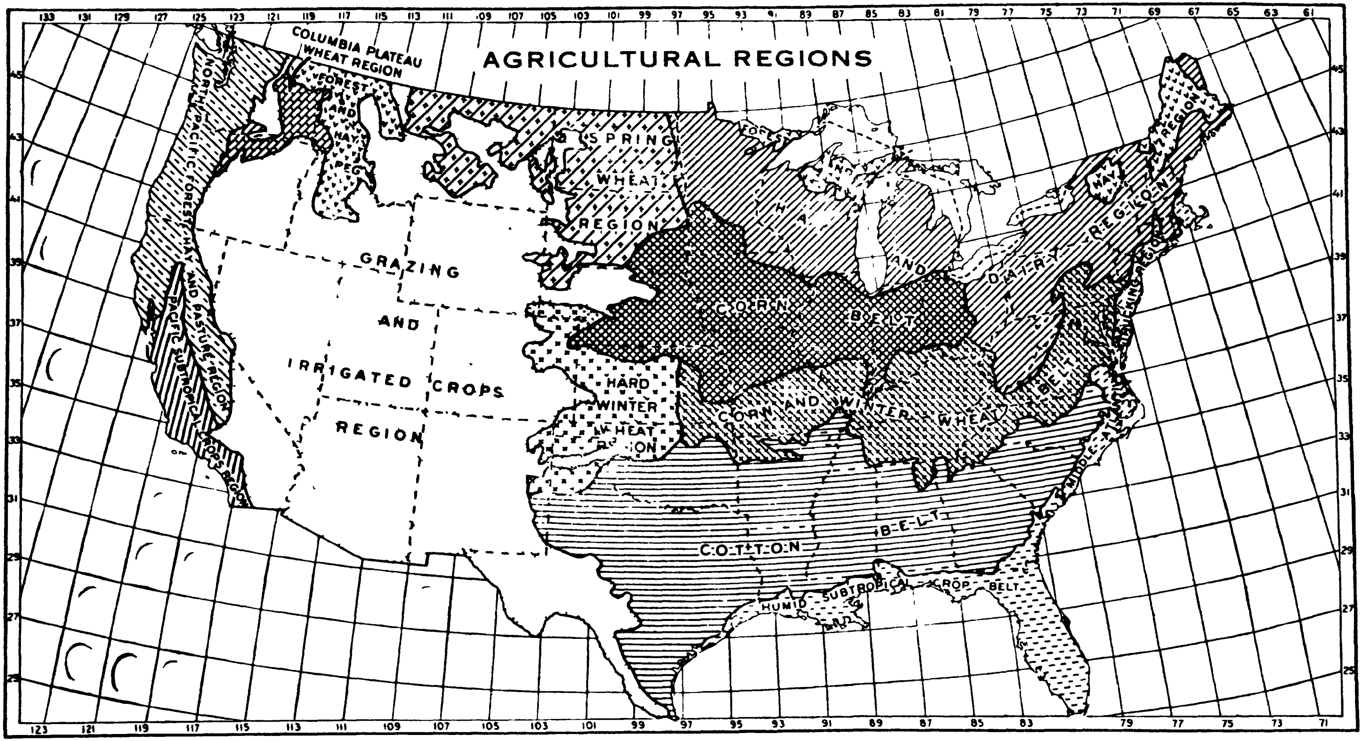
AGRICULTURAL REGIONS
COLUMBIA PLATEAU WHEAT REGION
FOREST AND HAY
SPRING WHEAT REGION
FOREST AND HAY
HAY AND DAIRY REGION
GRAZING AND IRRIGATED CROPS REGION
CORN BELT
HARD WINTER WHEAT REGION
CORN AND WINTER WHEAT BELT
COTTON BELT
HUMID SUBTROPICAL CROP BELT
MIDDLE ATLANTIC TRUCKING REGION
NORTH PACIFIC FOREST, HAY AND PASTURE REGION
PACIFIC SUBTROPICAL CROPS REGION

Figure 22. Types of Farming or Agricultural Regions of the United States. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

of latitude and temperature conditions. The West is divided into four large regions based on the use of land for grazing or crops, determined in turn chiefly by altitude and rainfall (see Figure 22).

Cotton farms are the type most numerous in the United States, comprising approximately a fourth of the six million farms, with general farming, dairy, self-sufficing, animal specialty, cash grain, crop specialty, part-time, poultry, fruit, truck, and stock ranch units following in the order named. Cotton and tobacco farms number more than two million, or more than a third of the total. These are concentrated in the ten southern states where the average size of operating units is comparatively small and where Negro sharecropping and single-crop farming have created serious land use problems. The large livestock feeding operations of farmers in the corn belt make livestock (hogs, beef cattle, and lambs) the major source of income for almost three-fourths of a million farms located largely in the Midwest. Dairy products furnish the major source of income for almost as many farms as do meat animals. These are located principally in the Lake states and New England (see Figure 22). Poultry products furnish the major source of income for nearly a quarter of a million farms concentrated largely in the Pacific Coast and Middle Atlantic states. The balance of American farms (approximately a quarter of a million) classified on the basis of major source of income include fruit and nut farms, principally in California, Washington, and Oregon; vegetable farms, largely in Delaware and New Jersey; horticultural specialty farms in the Pacific Coast and Middle Atlantic states, and other livestock product farms, including Angora goats for production of mohair on the Edwards Plateau in Texas.

Corn is the largest single crop produced in the United States, from the standpoint of acreage, more than a fourth of the total crop area being devoted to this crop. The United States raises about 60 per cent of the world's corn crop. Hay is the most widespread of all the crops, and utilizes nearly a fifth of the total agricultural acreage. Wheat is next in importance, ordinarily, utilizing about 17 per cent of the United States crop acreage. Some 70 per cent of the wheat acreage is located in the Great Plains area. The United States ordinarily raises a fifth of the world's wheat crop. Cotton utilizes more than a tenth of the total crop acreage, and the United States raises about three-fifths of the world's total cotton crop. Oats utilize about a tenth of the total crop acreage. Barley utilizes less than a twentieth of the crop acreage, or less than half as much as oats. Barley production is concentrated largely in the Northwest in the spring and winter wheat belts. Sorghums utilize more than 2 per cent of the total crop acreage, and are grown largely in the Southwest, but in recent years special varieties have been found to be adaptable as far north as South Dakota. Crops such as potatoes, tobacco, apples, oranges, dry beans, sweet potatoes, and flaxseed are important in the aggregate, but each utilizes a very small proportion (ordinarily less than 1 per cent) of the total crop acreage.

Agriculture in Arid Regions. Nearly 1200 million acres, or more than three-fifths of the land area of the United States, are classed as arid. These lands are situated in the western half of the nation and it is here that the more spectacular land use problems of dust storms and widespread farm abandonment and migration have recently occurred.[20] The characteristics of the arid regions are so different from those of the humid areas that special adaptative practices must be devised if they are to be successfully used.

Generally speaking, an average yearly precipitation of about 18 inches seems to be the marginal point for successful crop production without special adaptative procedures to conserve or add water. The farther south, the higher must the precipitation be to be equally effective, because of greater evaporation and more torrential rains. The lands of the Southwest, with less than 10 inches of rainfall, are considered definitely arid, and no attempt is made to farm them without irrigation. In the Middle West and the East, on the other hand, natural precipitation is such that crop production can be undertaken without danger of complete crop failures caused by lack of rainfall in any period. However, the semi-arid and subhumid regions, which receive from 10 to 20 inches and from 20 to 30 inches of precipitation respectively, are definitely "in-between country," neither strictly arid nor strictly humid. Since the average precipitation in this section is so near the critical point required for the successful production of crops, any deviation therefrom is extremely important.

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[20] The 1940 Census showed that the only states with appreciable population declines during the thirties were the five states of Kansas, Nebraska, North Dakota, Oklahoma, and South Dakota, which lie directly in the north-south line marking the transition from thirty-inch to twenty-inch or lower rainfall. The only other state to show a decline in population was Vermont, with a decline of 0.1 per cent, while the five Great Plains states mentioned had declines of 4.3 per cent, 4.5 per cent, 5.7 per cent, 2.5 per cent, and 7.2 per cent respectively.

Tree ring growth studies and studies of lake beds and other Great Plains geologic formations indicate that the history of the region has been one of recurring droughts causing complete crop failures for

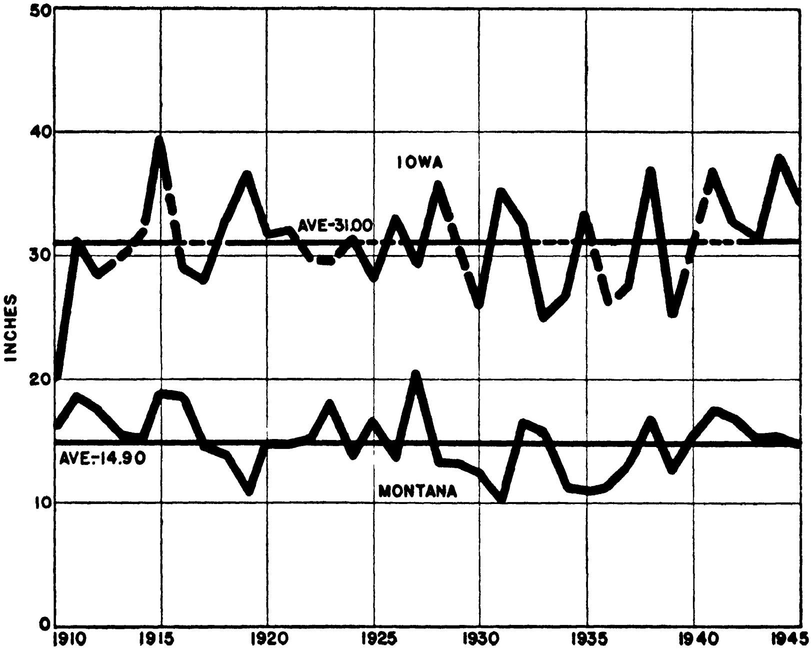

FIGURE 23. Average Annual Precipitation in Iowa and Montana, 1910–1945. (Compiled from U. S. Department of Commerce Weather Bureau data.)

several succeeding years, followed by periods of above average precipitation and yields. It is the relative certainty of successful crop production without special adaptative land use procedures that is the outstanding characteristic distinguishing humid areas from semi-arid and subhumid regions (see Figure 23). Without this natural margin of safety to absorb economic stresses and strains resulting from the yearly precipitation variations common in humid areas, farm operators in semi-arid and subhumid regions like the Great Plains area must organize their farms and ranches so as to furnish a workable substitute for this natural buffer or cushion.

Dry Farming. Three types of agriculture have been developed in the arid regions—dry farming, ranching, and irrigation farming. Before 1910, most of the Great Plains had been utilized primarily for livestock grazing, but after that date the area in tilled crops increased greatly and dry-land farming became the major type of use. Grain, especially wheat, has been found to be the most drought-resistant crop, and most of the dry-land agriculture of the arid regions is devoted to producing this single cash crop. The combination of comparatively favorable precipitation, high wheat prices in the war years, temporary large yields from the virgin sod, and availability of free land permitted establishment of farms quite similar in size and operation to those characteristic of the more humid areas from which the settlers came. However, with return to more normal price levels, more normal, and in some years below-average, precipitation, settlement of most of the formerly free land, and the decline in yields after the virgin sod had been cultivated for a time, farm operators in the arid regions soon realized that they would have to adapt their land utilization practices in order to survive.

One of the first adaptations made in the arid areas of the United States and Canada was summer-fallowing. Summer-fallowing is the procedure of tilling the land every year, and raising a crop only in some years. On an alternate crop and summer-fallow basis, the land is planted with grain every other year, and tilled to destroy weeds and form a dry mulch to conserve moisture in alternate years, so that the conserved moisture of one year and the current rainfall of the next year will be sufficient to raise a satisfactory crop. In some areas where moisture conditions are comparatively good, summer-fallowing every third year has been practiced.

Summer-fallowing has been sufficiently effective in many arid regions to enable successful crop production. However, it has caused serious problems of soil blowing and has necessitated significant adjustments in organization of farm operating units and in land utilization practices, including greater acreages in the farm unit, additional adaptative tilling techniques, including strip farming, to conserve the soil.

Ranching. A ranch, strictly speaking, is that amount of land and equipment devoted to production of livestock through grazing, occupying most of the time of one or more operators. In other words, ranch land is not utilized by tilling or raising crops; instead, livestock graze the natural vegetation. Stock farming is a combination of farming and grazing; on stock farms, crops are raised to feed the livestock. Formerly, ranchers raised no crop, not even tame hay, for livestock feed; and even today, many areas in the western arid regions, where ranching is the major type of land utilization, raise no crops of any kind but cut wild hay or native hay or grasses, and feed this to livestock during the winter when the range is covered with snow and cannot be grazed. Failure to produce supplemental feeds or hay for winter use in the early days was one of the most important factors contributing to disastrous failures of many ranches during severe winters. More and more ranchers in the arid areas are coming to appreciate the desirability of putting up a considerable amount of native or tame hay for winter feed. Wherever irrigation water is available for economic use in ranching areas, it is being used to produce hay for livestock feeding.

Ranching units in western arid regions are necessarily relatively large, causing a sparse population and high per capita costs of schools, roads, communications, and related services. In addition, ranching is characterized by relatively slow turnover. Moreover, the ranch directly supplies very little of the total living of the ranch family, and this high degree of commercialization means that ranchers are particularly affected by price fluctuations.

The western range produces annually a large number of feeder cattle for the feed lots of the corn belt. About one-sixth of the cattle and calves of the United States are located in the eleven western states, Texas leading all states, with an average of between 6 and 7 million head. The eleven western states contain nearly half the United States total of sheep, and produce approximately half the wool clip.

Irrigated Farming. The artificial application of water to arid lands may make many otherwise unproductive lands very productive. For successful irrigation farming, water must be available, the user must be able to control the water supply and apply moisture when and where it is needed, and the supply must be capable of being utilized in economically feasible ways, so that costs are not excessive. In addition, the soil must possess certain qualities if irrigation efforts are to be profitable. Land which is too porous and drains easily will absorb excessive amounts of water without correspondingly adequate returns; while land which has extremely poor drainage will tend to waterlog, and, in the high-evaporation areas characteristic of arid regions, alkali will tend to accumulate in the top few inches of soil.

The value of irrigated land in connection with dry farming and ranching has been mentioned. Although the acreage irrigated will never be a large percentage of the total acreage of the arid regions, the production of the irrigated lands far outweighs their proportionate acreage. Irrigation farming is usually an intensive method of utilizing land, and yields per acre are several times those from comparable lands.[21] The greater intensity of land use in irrigated areas permits adequate farm units to be smaller, so that population density per square mile is much greater than in dry farming or ranching areas.

Some 20 million acres of irrigated land, mostly in the eleven western states, are used for agricultural production. In the aggregate, irrigated farming is a significant factor in American agriculture; but in certain specific local areas, it is particularly important in stabilizing production and furnishing necessary winter feed reserves for stable and successful ranch operation. It permits production of a greater variety of crops, and enables many operating units to produce a major portion of the foodstuffs used by the family, with a salable surplus of many of these products to supplement operating incomes. Since irrigation farming must compete for the use of water with all other alternative uses to which water can be put, including generation of hydroelectric power, recreation, and transportation, as well as land drainage, it can more logically and adequately be treated in connection with the larger field of the economics of water utilization (see Chapter XI).

Land Use Practices Adapted to Arid Conditions. Because of the natural characteristics of arid regions, and especially of the semi-arid regions where dry-land agriculture is practical, farm operators must devise methods of adaptation to anticipated variations in growing conditions. People who settled the Plains from humid eastern areas, from the western seaboard, or from foreign nations (particularly the British Isles and the Scandinavian coun-

[21] For example, in Montana only about 2 per cent of the total land area is irrigated, but of the people on farms in the state, about a third are on irrigated farms or ranches, and the value of the irrigated land in farms (including buildings) amounts to 36 per cent of the value (including buildings) of all land in farms in the state. (P. L. Slagsvold and J. D. Mathews, "Some Economic and Social Aspects of Irrigation in Montana," Montana Agricultural Experiment Station Bulletin 354, January 1938, p. 3.)

tries, which are extremely humid) transplanted the culture of these humid areas to the Great Plains, postponing necessary adaptations. Such adaptations were not immediately necessary, because the arid regions experienced relatively heavy rainfall during the period of heaviest settlement and fabulous wheat prices during the First World War. However, with more normal rainfall and the inevitable droughts which occurred later, the consequences of an unadapted culture became evident.[22]

The cardinal feature of a farm economy adapted to the variations of growing conditions characteristic of semi-arid regions is flexibility, or as one writer has put it, the ability to "roll up and unroll," much after the manner of some plants which have structural provision for living through unfavorable growth periods in order that they may later take advantage of suitable growing conditions.[23] In order to achieve this flexibility, the farm operator needs a combination of enterprises which will allow him to take advantage of good growing conditions when they occur, and to cut down during unfavorable periods to avoid dissipating his accumulated reserves. This process of expanding promptly in certain periods and shutting down drastically and suddenly in others is not consistent with usual conceptions of good farm management practices, because most budget items in the farm management account require continuous and steady operation for highest efficiency. However, such "rolling up and unrolling" procedures are essential in areas where precipitation variations occur in an irregular and unpredictable manner above or below a norm which is so close to the margin of successful crop production that bumper crops or complete crop failures occur from time to time.

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[22] Many settlers were poorly equipped, from the standpoint of background and experience, to understand and effect the land utilization practices which would work most efficiently in the arid regions. In a study of the Triangle Area in North Central Montana, Wilson found two deep-sea divers, six musicians, two butchers, two milliners, two draymen, two wrestlers, two blacksmiths, two schoolteachers, two physicians, and one bartender. (M. L. Wilson, "Dry Farming in the North Central Montana Triangle," Montana Extension Service Bulletin 66, June 1923.) For a comprehensive analysis of the consequences of an unadapted culture in the Northern Plains, see C. F. Kraenzel, Wm. Thomson and G. H. Craig, "The Northern Plains in a World of Change," Gregory-Cartwright Ltd., Canada, October 1942; and C. F. Kraenzel, "New Frontiers of the Great Plains," *Journal of Farm Economics*, vol. XXIV, no. 3, August 1942, pp. 571–588.

[23] E. A. Starch, "Type of Farming Modifications Needed in the Great Plains," *Journal of Farm Economics*, February 1939, p. 115.

Achieving a diversification or combination of enterprises which will give the flexibility needed for the "rolling up and unrolling" practices essential in the arid regions is extremely difficult within the boundaries of an individual farm or ranch operating unit. *Area diversification,* rather than diversification by specific farm units, may be an adaptative procedure which will be useful. With area diversification, the farm headquarters would be located in the irrigated area along streams where feed crops and a large garden for the operator's family could be grown; wheat could be grown upon good nearby land extending back to the benchlands above the irrigated valleys; and, finally, livestock could be run on grazing lands lying beyond the wheat-producing benchlands in the foothills or near the mountains. Modern rubber-tired machinery permits operating wheat lands several miles from the farm headquarters without much loss in efficiency. Grazing areas could be handled cooperatively and cattle cared for by cooperative grazing associations during the grazing season. Thus, a farm operator could have a few acres of irrigated land surrounding his headquarters, additional wheat-producing acres on the benchlands within a radius of ten, twenty, or thirty miles from headquarters, and an allotment of a number of animal units of sheep or cattle in the grazing district on the range lands beyond the wheat lands.

But achieving flexibility in arid regions to the extent necessary for successful farm operation requires more than flexibility through diversification; it requires flexibility in overhead costs—particularly debt service charges and taxes, the two major fixed operating costs in agricultural land utilization.

DISTINGUISHING CHARACTERISTICS OF AGRICULTURE AS AN INDUSTRY

Each major land use has distinguishing characteristics caused by the interplay of numerous physical and human forces peculiar to it. An appreciation of these is essential for an adequate understanding of the problems associated with utilizing land for each major purpose. These problems, which are the basic concern of the science of land economics, are tenure, valuation and credit, taxation, conservation, and control of use, all of which stem from the human relationships growing out of the institution of property in land.

Farmer Has Little Control over Production. Changes in production of agricultural commodities are much influenced by weather conditions and natural forces, unlike the production of most other industries. Insect pest ravages and weather conditions largely determine the crop yields of farm lands, the carrying capacity of grazing lands, and the quality of soil products. Consequently, farmers exert much less control over output in any year or any brief period of time than operators in most other industries; and the volume of agricultural production may not respond promptly to changes in demand.

Unless the weather cooperates perfectly, prices of farm products are likely to rise more quickly and to higher levels with a demand increase than prices of manufactured goods. Although the farmer may respond to increased demand by increasing his acreage, it may yield a smaller output rather than a larger one, so that there is no increased supply to help hold down rate and extent of price increase. Manufacturers are in a better position to respond promptly to price increases resulting from increased demand by expanding volume of production, since weather factors are much less important. During periods of declining demand and falling prices, agricultural prices are likely to decline most because, even though farmers may decrease acreages planted somewhat, exceptionally favorable weather may result in an output which is just as large as before, or larger, so that the heavy volume tends to depress prices relatively more than the shrunken volume of manufactured goods. Thus, it may be said that farm prices tend to react more vigorously than non-farm prices to upswings and downswings of the general price level accompanying changes in purchasing power and demand. This tends to result in serious disparities between prices of things farmers buy and prices of things they sell.

Many agricultural land utilization problems, particularly problems of soil erosion and declining fertility, have resulted from the economic difficulties facing farmers as a result of these disparities. These disparities associated with physical conditions in agricultural production are increased by the economic conditions of pure competition characteristic of agriculture, as contrasted with imperfect competition characteristic of manufacturing enterprises. Farmers attempting to make economic ends meet find it necessary to tighten their belts or take a little more out of the soil. Frequently both are involved, and the soil is exploited, or utilization techniques are faulty, or producing ability is lowered. It is much easier for farmers to follow land use practices that maintain and improve soil fertility and producing ability when they have a satisfactory income and can meet necessary expenses without too much difficulty. It is under the stress of economic poverty and the urge to secure more dollars with which to meet necessary operation and living costs that most serious exploitation of land resources occurs.

Agriculture not Highly Commercialized. Agriculture generally is much less commercialized than most industries, and consequently reacts differently to price and income changes. In farming, home and business are one, and the family is usually the principal source of labor. Consequently, when prices decline rapidly, the farmer can seldom save by curtailing his individual output, because (1) he hires little labor and cannot fire his own family, and (2) his variable expenses constitute a relatively small percentage of his total. Correspondingly, expansion of farm production, when prices rise in response to increased demand, is much less prompt and comlete, even assuming uniform weather conditions.

The fact that agriculture is less commercialized than most other industries tends to penalize farm operators, who are unable to take advantage of price changes as effectively as other operators can. However, the fact that the farmer incidentally secures a large portion of his own living from his operations, and that agriculture is not highly commercialized, tends to create a more personal and responsible interest in the soil and its utilization. Utilization is not likely to be as ruthless or exploitative as it would be in a highly commercialized type of farming, particularly during periods of low prices and low earnings. In some areas, where agriculture has become highly comercialized—such, for example, as the spring and winter wheat belts of the United States—"suitcase farmers" are numerous.[24] Such highly commercialized one-crop farming frequently results in land use practices which do not prevent soil erosion and maintain productivity. Such operators frequently fail to follow recommended summer-fallow and water conservation practices, and try to make a killing whenever weather conditions seem favorable, letting the land lie idle or go to weeds in less favorable years. The economic and social consequences of such "suitcase farming" are numerous and serious. Similar criticisms could be made of other highly commercialized agricultural undertakings in which the land is exploited when profit prospects are good, and allowed to deteriorate or become foul when profit prospects are poor. The continuity of attention and husbandry necessary to secure most consistent and satisfactory production from the utilization of land is lacking in highly commercialized enterprises, with the result that basic natural resources are frequently permanently dissipated.

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[24] Suitcase farmers plow the land and seed the wheat in the spring with extensive equipment, and return to town or to some other area where their regular residences and jobs are located. At harvest time, they return and harvest the crop with a large combine and tractor outfit.

Agriculture a Relatively Small-Scale Industry. The fact that most farm operating units are on a family basis, operated largely with family labor, means that the size of the business is limited to an acreage that can satisfactorily be handled with family labor under the given system of farming followed. For example, in the United States the average farm contains about 174 acres, the value of all farm buildings (including the dwelling) averages approximately $1700 per farm, and the value of all farm implements and farm machinery about $500 per operating unit.[25] It is evident that even in the United States, where much farm machinery is used and a considerable investment often made in farm buildings and dwellings, the average size of farms is extremely small compared with that of modern large-scale industries and factories. Though many have criticized such small farms on the grounds that they do not permit the farm operator to combine the factors of production most efficiently or use his managerial ability most fully, the family-size farm has remained the dominant type of farm unit throughout the world.

The advantages alleged for corporation farming include economies in buying and selling, in management, and in use of machinery and man power. However, these are apparently more imaginary than real, because such factors as the seasonal nature of work on most farms, the uncertainties of weather, the difficulties of overseeing laborers when they are scattered over a large area rather than concentrated in one or two floors as they are in a factory, have made it impossible for corporation farms to meet the competition of the smaller family-size units. Moreover, the large corporation or

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[25] According to the 1940 census, the 6,096,789 farms in the nation had buildings valued at $10,405,085,980, or an average of about $1700 per farm and $3,059,266,327 of farm implements and machinery, or an average of approximately $500 per farm.

"bonanza" farms do not possess any of the self-sufficing features of the family units, and are fully exposed to the vagaries of price cycles and weather which determine the success or failure of farming. Mechanization of agriculture has resulted in an increase in the average size of farms in the United States.[26] In the five years from 1935 to 1940, the average size of farms increased from about 155 acres to 174 acres (nearly twenty acres per unit), and the number of farms in the nation declined from 6,812,350 to 6,096,789 (a decrease of more than 700,000). This increasing mechanization will promote an agriculture which is more commercialized and more exposed to the vicissitudes of nature and the price cycle. The resulting effects upon land utilization practices will be far-reaching.

The desire to secure the most satisfactory combination of productive factors in agriculture has caused much study of the most economic sizes of operating units. What constitutes an economic or adequate unit will depend largely upon the type of farming. In a self-sufficing type of agriculture, the economic unit will be of that size which utilizes most efficiently the entire family labor available for work. Such a size of unit would enable the farm family to produce the largest possible amount of goods which it will need for its living. On the other hand, if the type of farming is highly specialized and commercialized, the economic unit will be of that size which utilizes the operator's managerial ability and capital most efficiently, and enables him to make the highest possible net return.

There is no one ideal economic or adequate size. The most desirable size will depend largely upon what the farmer is trying to do with his farm and under what circumstances he is trying to do it. Nevertheless, budgets worked out by farm management specialists for different types of farms in various areas, which show the minimum-sized operating units that will use certain types of machinery efficiently or produce a certain minimum net family income under average conditions, are useful guides in determining the general pattern of farm operating units for most satisfactory land utilization.

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[26] It is estimated that 1,626,000 tractors were in use in 1939, which is almost double the number reported in 1930. Three-fourths of the tractors sold are estimated to be general-purpose tractors, and it is predicted that 500,000 more tractors will be in use on American farms by 1950. (*Technology on the Farm*, Government Printing Office, August 1940, pp. 9–12.) The number on farms January 1, 1945, according to the U. S. Department of Agriculture, was 2,072,000.

Agriculture a Highly Competitive Industry. The dominance of small, family-sized diversified farms creates many individualistic, competitive operating units. Agriculture is the last large segment of modern economies in which such units predominate. In many manufacturing and industrial plants, competing units have combined until a few large units control most of an industry's output. Such combinations and concentrations of control have never occurred extensively in agriculture, and its highly competitive nature generally means that changes in demand bring about price changes. On the other hand, because of its characteristic concentration of economic control, or monopoly, modern industry adjusts to decreased demand chiefly through output changes, not through price changes. This is substantiated by the record of industrial and agricultural production and prices in the United States during the depression of the thirties.[27] Thus, industrial product prices tend to be more rigid and output more elastic than prices and market supply in agriculture, where competition operates more completely. The land utilization practices of farm operators are largely determined by the effects of the competitive nature of the agricultural industry upon them, and the disparities between prices they receive and prices they pay. Economic disadvantages resulting from these price disparities tend to force users to exploit the soil and fail to maintain productive capacity of their lands, particularly during periods of generally declining prices and falling demand, when price disparities are most pronounced.

Agriculture an Industry Characterized by Relatively Slow Turnover. A large portion of the farmer's investment is in land and buildings. In the United States, the average farmer has a total of $6020 invested in land, buildings, implements, and machinery; and of this amount, $3810 (63 per cent) is invested in land. Opportunities for substituting one crop for another are limited because of soil, climate, plant diseases, technical factors, and so on. It requires from twelve to twenty years to get a good stand of native grass established on Great Plains land formerly used for grain production, and some ten to twelve years to establish a good orchard in most areas. A farmer's decision to expand or curtail output must be made many months, or sometimes years, in advance of marketing his product.

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[27] Industrial production in the United States declined from 115.2 in 1929 (1924-1929 = 100) to 60.7 in 1932, while agricultural production during the same period increased from 101 in 1929 to 107 in 1931, but declined to 100 in 1932. During these same years, prices received by farmers declined from 146 to 65, whereas prices paid by farmers for commodities they purchased declined only from 153 to 107. (See *1941 Outlook Charts—Demand, Credit, and Prices*, U. S. Department of Agriculture, Bureau of Agricultural Economics, Agricultural Marketing Service, October 1940, pp. 2, 7, and 14.)

There is less possibility of extensive mechanization in agriculture than in most non-agricultural fields, because the seasonal nature of agriculture and the technical production conditions for many types of crops and livestock make the efficient use of machinery impossible. Consequently, agricultural production is ordinarily a matter of combining labor with land and limited capital inputs, so that the investment ratio is fixed, in comparison with circulating capital, and is greater than in most non-agricultural industries. All things considered, therefore, agriculture is more rigid and less able to adjust quickly and completely to rising or falling prices than most non-agricultural industries.

Demand for Agricultural Products Relatively Inelastic. Consumer demand for most agricultural products is relatively inelastic compared with the demand for many non-agricultural products. Human wants for farm products are comparatively satiable. The human stomach can consume just so much and no more. However, there is considerable elasticity in the wants of consumers for different types of food. This is another way of saying that the total importance of farm products is very great, while their marginal importance is modest. We might eliminate more than 40 per cent of our farmers and still be able to supply our population with basic foods and fibers, but it would be impossible to eliminate all farmers. Demand for many types of farm produce can be quickly satisfied, and beyond that volume a definite surplus arises. This is true of all commodities, to a certain extent, but the amount wanted at different price levels will fluctuate much more with respect to the wholesome non-essentials than to necessities of life such as the foodstuffs, which comprise such a large proportion of the agricultural output.

Agricultural Population Widely Scattered. In longer-settled nations, farm people often live in villages and travel to and from their farm lands. In the United States, Canada, and many of the more recently settled nations, operators live on their farm units; and since area is so important in agricultural land utilization, farm populations under this pattern are widely scattered. The population density of many farm communities (particularly in the western range areas) is less than one per square mile; and even in the more densely settled agricultural areas of the Middle West, population density in farm communities in some states averages only sixteen persons per square mile.

The relatively low population density of agricultural areas increases per capita costs of such necessary services as schools and roads, or communication facilities, and is an important cost factor in agricultural land utilization.

Great Importance of Fixed Charges in Agricultural Industries. Fixed charges are generally more pronounced in farming than in non-agricultural industries. Some of the principal reasons for the relative importance of fixed charges in agriculture are: (1) Differences between agriculture and other industries in the methods by which outside funds are secured. In agriculture, outside funds in money are obtained largely through mortgage instruments which call for a fixed money payment of principal and interest regardless of farm income, whereas industrial enterprises obtain a large portion of their outside money funds through the flotation of common stocks or ownership equities which are exchanged for a share of the net income, if any. (2) Real estate (land and buildings) comprises a much larger percentage of the total capital investment in agriculture than in other industries, and consequently property taxes fall heavier on agricultural enterprises than on non-agricultural. Property taxes are relatively rigid, and do not vary with price changes as do the income, sales, or similar taxes which are more important for non-agricultural industries. During periods of price declines, public expenditures ordinarily increase because of unemployment and relief expenditures, and after a war, public expenditures increase to service debt incurred to finance the war. During such periods, the amount of revenue secured from income and sales taxes tends to decline in relation to the total revenue required, while property taxes are not reduced, and may even be increased. This occurred in the United States during the severe deflation following 1920,[28] and the resulting serious consequences to agriculture were factors which contributed to agricultural land tenure, credit, taxation, and conservation problems.

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[28] Indexes of farm real estate taxes per acre rose steadily during the twenties to 281 in 1929 (August 1909–July 1914 = 100). Although farm property taxes declined during the thirties, the index in 1938 was 186, while the index of all commodity wholesale prices was 115, and the index of prices received by farmers, 95 (U. S. Department of Agriculture, *The Agricultural Situation,* Bureau of Agricultural Economics, March, 1940, vol. XXIV, no. 3, p. 24). See

PECULIARITIES OF LAND IN AGRICULTURAL USE

The preceding section has pointed out several characteristics of agriculture which distinguish it from non-agricultural pursuits, and which lead to some of the more important problems involved in utilizing land for agricultural purposes. This section discusses some of the more significant peculiarities of agricultural land growing out of these distinguishing characteristics of agriculture.

Importance of the Spatial Element. One of the most important characteristics of agricultural land is the spatial element. The average farm in the United States is about 174 acres in size, and the land in forms exceeds one billion acres—more than half the land area of the country. In drier or less productive areas, the average farm is considerably larger.

In urban land use, if the demand for apartment space or for commercial use increases, it can often be met by more intensive use. Adaptation may be made largely by building upward or expanding vertical use. It is impossible to increase the output of agricultural land by this method. If demand for vegetables increases, more acres must be brought into production, because it is not possible ever to increase vegetable production by raising vegetables in stories or crowding them together, after a certain point is reached, even with tray agriculture. In other words, a certain amount of space, sunlight, and plant nutrients must be provided for each individual plant.

The importance of the spatial element in agricultural production may cause a nation to adopt an imperialistic policy if demand for agricultural products increases. Imperialistic policies of some modern nations, including the recent *lebensraum* ("living space") policy of Nazi Germany, have been planned to secure control of more agricultural land to feed and support growing industrial-urban populations. The technological economies of modern nations have re-

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also Siegfried von Ciriacy-Wantrup's "The Relation of War Economics to Agriculture, with Particular Reference to the Effects of Income and Price Inflation and Deflation," *American Economic Review*, Part 2, Supplement, March 1940, vol. XXX, no. 1, pp. 366–382, and the author's treatment in "Effects of the War on Agriculture," *Proceedings of the Fourth Annual Pacific Northwest Conference on Banking*, State College of Washington, Pullman, Washington, April 4–5–6, 1940.

sulted in greater desire for lands containing basic raw materials—particularly oil and such minerals as coal and iron—rather than purely agricultural lands.

Importance of Fertility. David Ricardo referred to the "original and indestructible" properties of land. Location or extension, or physical area, is the most indestructible of all characteristics of land. The qualities of the soil commonly referred to as "fertility" which give it the ability to support plant life are not indestructible. It is true that some soils are heavily endowed with the qualities which support productive plant growth, and that man has been able to utilize some of these lands year after year, with little regard for scientific soil management, and yet continue to secure good crops. On the other hand, some soils less richly endowed fail to yield satisfactory crops after a few years, unless commercial fertilizer is added to supply necessary plant nutrients, or crop rotations and proper soil management practices are followed.

Results of the Rothamsted experiments in England furnish data on the indestructibility of fertility. At this famous experiment station there is a plot that has been sown to wheat continuously since 1839, with no fertilizers added. During the first eighteen years production declined, but for the last thirty years yields have remained practically constant. Fluctuations have been due to character of the season, corresponding closely with yield fluctuations on fertilized plots. The test plot seems to have reached a stationary condition, yielding a crop which averages twelve and a half bushels to the acre, which will probably continue or be reduced only slightly in the future. The yield on this plot corresponds closely with crop yields throughout Europe during the Middle Ages, when no fertilizers were used and crop rotations were practically unknown. For more than a thousand years, this stationary yield supported the European population.[29] Apparently natural soil processes each year make available enough plant nutrients to produce about twelve and a half bushels, so that ordinarily crop yields will not be reduced below this amount. Therefore, it may be said that reduction of fertility below this point in appreciable amounts is usually impossible. However, the fact that the land produced much more than this in the beginning and could produce much more than this with proper soil practices, including desirable crop rotations, indicates that fertility or producing ability is relatively destructible.

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[29] See Van Hise and Havemeyer, *op. cit.*, pp. 377, 378.

Fertility may be destroyed in ways other than by overcropping or by land use practices which use up most of the essential plant nutrients (particularly nitrogen, potassium, and phosphorus). Improper land use may produce serious wind or water erosion which removes much of the solid matter in the top few inches. It has been estimated that soil erosion annually removes fifteen hundred million tons of solid matter in the United States, wasting 126 billion pounds of plant food, which is twenty-one times the annual net loss due to removal of crops.[30] In many areas where the top few inches have been removed through erosion, several years are required to bring back productivity because organic matter and necessary plant nutrients must be reestablished or applied to the eroded surface before satisfactory plant growth can be achieved. In some areas, absolute failures result during the first two or three years crops are attempted on badly eroded soils that have lost their top few inches.

It seems obvious, therefore, that while the fertility of most lands cannot be destroyed to the extent that the lands will produce absolutely nothing, fertility can be reduced significantly by land use practices. Man is unable to destroy the extension or physical area of land itself; and consequently, from the standpoint of urban land use or even the use of land for transportation purposes, man cannot destroy to the same extent the most important and basic qualities of the land. Fertility, therefore, is an especially important characteristic of agricultural land, and agricultural land use programs and policies must be developed and effected to maintain and, if possible, improve the ability of the land to produce agricultural products.

Absorption of Investments or Improvements in Agricultural Land. One of the principal ways in which land varies from other production goods is in fixity of investment. In agricultural land, improvements in the form of fertilizer, lime, green-manure crops, and related labor and capital inputs are absorbed by the land, and become so definitely a part of it that it is impossible to distinguish land from improvements. In the case of urban land utilization, much of the investment takes the form of buildings or structures which, although they are attached to the land, considered immobile, and classed as real estate, are nevertheless readily distinguishable from the land itself. For purposes of taxation, improvements can be assessed as improvements and land can be assessed separately on the basis of its bare land value. In the case of agricultural land, such separation is difficult and usually impossible. The implications of this ability of agricultural land to absorb and destroy the identity of much of the investment in it are particularly significant in taxation, particularly when proposals are made to tax "unearned increments." Such proposals have been frequently made by single-tax proponents.

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[30] *Ibid.*, pp. 361-362.

FUTURE AGRICULTURAL LAND REQUIREMENTS

We have noted a definite tendency for agriculture in modern nations to decline in relative importance, as invention and industry progress. The United States in one of the leading nations of the world in which this trend is operating. In view of this, what are the prospects for agricultural land utilization in the next few decades? What will the trend be in acreage devoted to crop land? What will be the effect of tray agriculture, or production of foodstuffs and fibers with chemicals? What effect will prospective dietary changes have upon the demand for certain agricultural products? What effect will the sweeping changes in farm technology have on agricultural land utilization practices?

Trend in Agricultural Land Utilization. The acreage of all land in farms in the United States has more than doubled during the past 65 years, increasing from 536 million acres in 1880 to 1143 million acres in 1945. The increase has been a continuous one, nearly 200 million acres having been added in the last two decades. However, the acreage devoted to the production of crops has not shown any corresponding tendency to increase. The crop land actually harvested in 1940 was considerably less than that harvested in either 1930 or 1920, and only slightly more than that harvested in 1910 (see Table 5). With the very heavy demand for food placed upon American agriculture during World War II, the acreage of cropland actually harvested increased above the 1940 level but did not reach the 1930 level of approximately 360 million acres.[31]

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[31] Cropland actually harvested totaled 347 million acres in 1943, 352 million acres in 1944, and 347 million acres in 1945. (U. S. Department of Agriculture, *Crops and Markets.*) There are 52 crops included in the cropland acreage tabulations. Additional production of food during World War II was primarily in livestock rather than in crops. (See T. W. Schultz, *Agriculture in an Unstable Economy,* McGraw-Hill, 1945, p. 15.)

TABLE 5. U. S. Population, Number of Farms, Land in Farms, and Cropland Harvested, 1880–1945

Year	Total Population	Number of Farms	Land in Farms		Cropland Harvested		
			Total Acres	Average per Farm	Total Acres	Average per Farm	Average per Capita
1880	50,262,000	4,008,907	536,081,835	133.7	166,186,584	41.4	3.306
1890	63,056,000	4,564,641	623,218,619	136.5	218,705,564	48.1	3.484
1900	76,129,000	5,737,372	838,591,774	146.2	282,218,280	49.2	3.707
1910	92,267,000	6,363,502	878,798,325	138.1	311,293,382	48.9	3.374
1920	107,190,000	6,448,343	955,883,715	148.2	348,548,549	54.0	3.252
1930	123,091,000	6,288,648	986,771,016	156.2	359,242,091	57.1	2.919
1940	131,669,000	6,096,799	1,060,852,374	174.0	321,242,430	52.6	2.440
1945	137,512,000[a]	6,010,522	1,142,817,821	190.1	346,974,000	57.7	2.523

[a] Estimated.

Sources. U. S. Department of Commerce, Bureau of the Census, *16th Census of the United States (1940)*, Agriculture, vol. II, chap. I, Table 4. U. S. Department of Commerce, 1945 Census of Agriculture—Preliminary, November 30, 1945, Table 1. U. S. Department of Agriculture, *Crops and Markets*, Government Printing Office, vol. 23, no. 1.

The per capita consumption of food in the United States has been remarkably stable since the First World War, despite the relatively good income level maintained during the twenties and the severe depression which characterized much of the thirties.[32] The per capita crop acreage harvested in the United States has tended to decline during the last quarter-century, indicating that less acreage is used today than formerly for non-human consumption. Prices of agricultural products have varied most, rather than consumption. The relatively constant per capita food and fiber requirement makes the comparative rates of technological advance in agriculture and total population growth of major importance to the occupational role of the farm plant in the economy.[33]

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[32] During the period 1909–1914, the per capita acreage used for human consumption averaged 1.9 acres, while during the period 1919–1924, the per capita acreage was 2.0. During the two following five-year periods, the average was 2.05 and 1.95. In 1935–1937, only 1.7 acres of crops per capita were used for human consumption, but 2.05 acres were used during the period 1937–1939. (H. R. Tolley, "Agriculture in the American Economy," *Proceedings of the 53rd Annual Meeting of the American Economic Association,* New Orleans, La., vol. XXX, no. 5, February 1941, p. 112.)

[33] John M. Brewster, "Farm Technological Advance and Total Population Growth," *Journal of Farm Economics,* August 1945, p. 512.

The decline in the foreign market for United States agricultural products after the First World War released some 25 million acres of cropland, much of which reverted to pasture or other comparatively extensive uses under the Agricultural Adjustment Administration program begun in 1933. The change in position of the United States from that of a debtor to a creditor nation, combined with high American tariffs, intense nationalism, high foreign tariffs, and expansion of production in exporting nations, affected our foreign market adversely. The concentration of gold in the United States resulted in reducing purchasing power of many importing nations during the interwar period which formerly bought considerable quantities of American agricultural products, and until international trade is freed from many arbitrary controls and restrictions, American farmers cannot look to the foreign market to use a large portion of their products.

Under conditions of full employment at home and active foreign trade, per capita consumption of many agricultural products would be higher than it was in the interwar years and for some commodities higher than it was during World War II. Greatest increases in the demand for food would occur among those types of products most needed in American diets from a nutritional standpoint. For example, the per capita consumption of dairy products might be expected to increase 10 per cent and that of citrus fruits 50 per cent above the 1935–39 average. Substantial increases would also be registered in per capita consumption of fresh and canned vegetables. However, if any appreciable increase in agricultural efficiency occurred, total requirements for all agricultural production could be met by cultivation of about 330 million acres of cropland, which is some 20 million acres less than that harvested during World War II.[34]

Capacity to Produce Farm Products. It seems logical to conclude, therefore, that the agricultural industry of the U. S., with parity prices, full employment, and active foreign trade, can produce an adequate and tasty diet for all the people, and still run the risk of piling up surpluses; and that if unemployment develops, American diets would be restricted and heavy agricultural surpluses in several commodities would reappear.[35]

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[34] Tolley estimates that this acreage would be adequate if average crop yields by 1950 should increase 10 to 12 per cent above prewar averages, if milk production per cow, and egg production per hen, were to increase about 5 per cent, and if the general efficiency with which feed is utilized by livestock should increase by 2.5 per cent. (See H. R. Tolley, "Agricultural Adjustment and Nutrition," in T. W. Schultz (ed.), *Food For the World,* University of Chicago Press, 1945, p. 170.)

About half the farms in the United States account for nearly nine-tenths of the total production, and if the market for agricultural products were available, present farms and labor in farm areas could produce considerably more than current output. Many agricultural leaders feel that present output could be produced with about half the current farm population. There seems to be no doubt about agriculture's capacity to produce; the most important factor determining agricultural land utilization in the future will be capacity to consume.

If all consumers in the United States were to have diets considered adequate by nutritional experts, vegetable consumption would probably be increased at least 50 per cent, and consumption of dairy products at least 15 or 25 per cent. Or, if the real incomes of all low-income families in the United States could be increased to $100 a month, the consumption of agricultural products could apparently be increased about an eighth (the equivalent of 30 to 35 million acres of cultivated cropland).[36] This increased domestic demand would therefore more than offset the decline in agricultural exports; and the problem of increasing the purchasing power of lower-income groups is one which should have an important place in American national policy. However, even if this policy is pursued, it is likely that increases in domestic consumption will be relatively gradual, and will be much greater for some types of products (particularly vegetables and dairy products) than for heavy energy foods (particularly cereals or fats). These increases will undoubtedly necessitate significant shifts in the pattern of agricultural land utilization between various crop or livestock products.

Certain technological changes now in progress may completely offset the increased need for agricultural land resulting from expanded domestic consumption. For example, the shift from horses to tractors, trucks, and automobiles on farms and in cities of the United States has reduced the number of work stock by some 13,500,000 head during the past quarter-century, and has released for commercial production the equivalent of at least 40 million acres of cropland, as well as a considerable acreage of good pasture land.[37] Thus this shift resulting from technological developments has more than offset the increased agricultural land acreage which would be needed if domestic consumers had the diets which nutritional experts consider adequate. A recent study of technology and its effects on farm people and employment indicates that between 350,000 and 500,000 farm workers may be displaced from farms before 1950.[38] The labor required on an acre of wheat is now less than half the amount needed in the prewar period, 1909–1913. The efficiency of producing livestock and livestock products has also increased greatly in recent years.

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[35] *Ibid.*, p. 172.

[36] H. R. Tolley, "Agriculture in the American Economy," *American Economic Review*, vol. XXX, no. 5, February 1941, p. 113. It had been estimated that during the depression years of 1935 to 1939 per capita food consumption was about 15 per cent less than it would have been under full employment conditions. (See J. P. Cavin, "The General Food Situation," U. S. Department of Agriculture, Bureau of Agricultural Economics, Address at 22nd Annual Agricultural Outlook Conference, Washington, D. C., November 14, 1944.)

Industrial Markets for Farm Products. The main business of the farmer is production of raw materials for food, clothing, and shelter, less than a tenth of the total farm output being used as industrial raw materials.[39] Some examples of the industrial uses of farm products are the production of leather, glue, gelatin, soap, greases, glycerin, and fertilizers from animal carcasses; starch for sizing and finishing textiles and paper; dextrin adhesive; glucose used in the rayon and leather industries; and a whole list of industrial chemicals and solvents from cereal grains.[40]

Expansion of the industrial market for farm products would not result in any immediate large increase in demand for farm products. Increased industrial use of farm products will be very gradual, and industrial use of some farm products will actually decline in the years ahead because of competition from other raw materials. New outlets for farm products as industrial raw materials appear limited.

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[37] *Loc. cit.*

[38] *Technology on the Farm*, p. 61.

[39] Over 80 per cent of the entire farm output is used as food, exclusive of tobacco products and beverages of all sorts. Another 5 per cent goes into clothing. Probably less than 10 per cent is used as industrial raw materials. (See Brewster, *op. cit.*, p. 510.)

[40] For a more complete analysis of present and potential industrial markets for U. S. agricultural products, see W. B. Van Arsdel, "The Industrial Market for Farm Products," U. S. Department of Agriculture *Yearbook*, 1940, pp. 606–626.

In the aggregate, nevertheless, and over a period of years, expanded industrial use may be a significant factor in future demand for farm products.

Population Trends. The recent decline in the birth rate, with little immediate prospect for any significant reversal of the trend, indicates that the tide of population will no longer rise rapidly and push general business up with it. Generally speaking, speculators in land can no longer rely on the hope that increasing density of population will cause property values to soar. Future land values will be based more and more upon soil productivity, and land use practices must be changed considerably if this productivity is to be built up and maintained.

The entire American economy is tending toward maturity—that is, rates of growth are slowing down, and certain types of new opportunities are becoming less frequent. This should not be taken to mean that the economy is contracting or that there are no more opportunities for further development or advancement. However, it does mean that the United States is moving toward a more stable population and that the future economic and social problems will differ considerably from those of the past.

The Agricultural Prospect. Effects of these changes and trends upon American agriculture will be in the direction of increased governmental control, or group controls of one form or another to adjust agricultural output more in line with prospective demand. Present cropland acreage seems to be adequate for decades immediately ahead, and unless the declining rate of population increase is changed, or the foreign market improved, or technological advance checked, the trend during the next few years will be more in the direction of taking some acres out of intensive crop uses and diverting them to pasture, forest, or soil building uses. During these years, there will be excellent opportunities to develop soil conservation practices which will restore much of the former fertility of many agricultural soils and raise the level of productiveness of agricultural land resources generally. In the more distant future, if full employment prevails, nutritional levels rise, the foreign market improves, and population numbers increase, agricultural lands of the nation will be in a better position to meet resulting increased demands for agricultural products.

With the declining trend in populations of many of the leading nations of the world, the prospect for agricultural land utilization generally is one in which there will be no great need for any considerable increase in the amount of land devoted to agriculture during the immediate future. Improvements in the reclaiming of worn-out or unproductive soil through improved land utilization and soil conservation practices, drainage, irrigation, application of fertilizers, and other techniques will enable increased demands for agricultural products to be met with present agricultural acreages, or with only slight increases in the total agricultural land area.

Thus, viewed from the domestic standpoint or that of the world as a whole, agriculture will probably not secure any extensive increase in acreage for producing crops or livestock in competition with other uses for land in the immediate future. In many nations the agricultural land area will tend to remain stationary or decline, losing to forests through reforestation programs, to recreation, and to other uses, with crop acreages reduced by regrassing programs, soil conservation, and soil improvement; in other nations, slight increases, and, pehaps in a few cases, significant increases in agricultural land may result.

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CHAPTER EIGHT

FOREST LAND

FORESTRY accounts for a larger acreage of the earth's surface than any other major use. Forest requirements are ordinarily enough less exacting than crop or pasture requirements that the forest acts as a residual use for land which agriculture and pasture cannot profitably utilize. Certain lands, of course, are not suitable even for forests. The settlement history of the United States is an excellent example of the encroachment of agriculture upon forest land, though this process has to some extent characterized settlement in every continent. Instead of considering the original forest as a basic resource to be conserved and sparingly used in accordance with demand, trees were considered an obstacle and a hindrance to more intensive uses.

Next to agricultural crops, forest crops have contributed most to human progress and security and, like agricultural crops, they are renewable.[1] Wood is the world's most versatile raw material. No other material provides fuel, fiber, food, and chemical derivatives while also serving a great variety of structural uses. Wood has played a significant role in the development of modern living standards, because of its almost countless variety of uses, including paper for the spread of knowledge throughout the world.

Importance of Forestry in the Economy. The importance of forests in modern economies varies greatly. Nearly a third of the area of the United States is forest land of one sort or another, estimated to be worth from 8 to 10 billion dollars. Of the major land uses, forest lands rank fourth in importance, being exceeded by urban land, land used for public highways, and agricultural land.[2] In spite of forest depletion for purposes of agricultural use, and heavy consumption of forest products in modern industry without reforestation to maintain the supply, forest products consistently contribute between 4 and 6 per cent of the total national income in the United States and somewhat less than this percentage of the total gainfully employed. Forest products make up about 8 per cent of all revenue freight carried by U. S. railroads; and the supplies, equipment, and other materials used by forest industries account for a large additional tonnage, the forest industry as a whole easily accounting for a tenth of all railroad revenue freight. U. S. forests support the fifth greatest manufacturing industry of the nation, being exceeded only by iron and steel, machinery, food, and textiles. In addition to these contributions, forests are particularly important in the conservation of water and soil, as recreational environment, as a natural habitat for many wild game and bird species, and in the production of forage and livestock grazing.

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[1] See "Third Report to the Governments of the United Nations by the Interim Commission on Food and Agriculture," transmitting report of the Technical Committee on Forestry and Primary Forest Products, Charles Lathrop Pack Forestry Foundation, Washington, D. C., 1945, p. 9.

[2] R. R. Doane, *The Measurement of American Wealth,* p. 199.

In nations like Finland, Norway, and Sweden, forests comprise a much greater proportion of the total land value, making a much larger contribution to the total income of the nation. Moreover, in nations where a sustained yield policy has been established over many decades through controlled cutting and systematic reforestation, forest land resources have not decreased in value as they have in the United States and other nations where more exploitative forest practices have been followed. At the turn of the century, forest lands comprised more than a tenth of the total value of land in the United States, while now they comprise only slightly more than a twentieth.

Forests cover approximately seven and a half billion acres, or about a fourth of the total land area of the earth. Thus, forestry uses much more of the earth's surface than agriculture (about an eighth), but it does not furnish employment to nearly as many of the population. The proportion of total land area in forests varies from as much as 60 per cent in Finland to less than a half of one per cent in Italy. In the United States, forests now use about a half billion acres, or a little more than a fourth of the total land area. This is about the average for all nations.

THE SUPPLY OF FOREST LAND

Trees are a crop, and the economic supply of land for forestry is determined by the same physical factors as those which determine the economic supply for agriculture. However, these factors do not operate within such narrow limits in the case of forestry.

Physical Factors Determining Suitability of Land for Forestry. Forest trees do well on soils on which most crops would fail or be unsatisfactory. Forest trees possess more permanent root systems than most crop or pasture plants, and their roots ordinarily penetrate deeper, tapping soil nutrients beyond the reach of the usual crop plants. Moreover, fertility is a less limiting factor, since trees have a life expectancy that includes many growing seasons. Studies of the growth rings in trees hundreds of years old reveal that in some years or periods very little growth occurred, because of poor growing conditions; and in areas of relatively poor soil, where annual growth is quite small, a very valuable tree can perhaps be produced after fifty, seventy-five, or a hundred years.

Forests are almost perfectly adapted to stony or rough land, or to sandy soils in humid areas; the annual production of pine timber in sandy soils is ordinarily equal in amount to hardwood production in the most fertile land. The growth of wood itself takes very few plant nutrients from the soil, and the large nitrogen requirements of trees are obtained chiefly from the air. Fallen leaves are not usually removed from the ground, lime, magnesia, and other minerals being thus restored to the soil and serving as a revolving fund for continual growth. As a matter of fact, a considerable portion of the minerals necessary to grow leaves is returned to the soil before the leaves fall.

Trees can grow well on mountain slopes where other forms of vegetation can seldom attain the status of crops. Twenty degrees has been given as the limit of slope for agriculture, 30° as the limit for meadow and pasture, and 40° as the limit for general tree culture for timber purposes.[3] However, much tree growth is found on slopes of more than 40°. The mulch of decaying leaves and litter accumulated on the ground and leafy branches above check the beating rains and help to make forests peculiarly adaptable to slopes or sites subject to erosion.

Whereas forests are less exacting as to soil and topographic requirements than crop and pasture plants are, they are ordinarily more restricted in moisture requirements. Although grasses are grown satisfactorily in the arid regions and are utilized by range livestock, trees will not grow there to any great extent. In semi-arid regions where crops can be grown successfully with the use of certain adaptation techniques such as summer-fallow, development of drought-resistant varieties, etc., trees are practically non-existent. In other words, trees ordinarily require more moisture than some hardy crops like wheat, and more than many pasture plants, especially in warm climates. In the far north, however, trees grow with an average annual rainfall of about eighteen inches. The conifer trees of this region, with their small, narrow, hard leaves, do not lose much moisture and therefore make efficient use of the limited supply available. Some commercially valuable trees also grow well in swampy land, which is not useful for agriculture without drainage.

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[3] H. Hausrath, *Forstwesen,* vol. VII, Part 7, of *Grundriss der Socialoknomik,* J. C. B. Mohr, Tubinger, 1922 (quoted in Zimmermann, *World Resources and Industries,* p. 402).

Forests are less restricted by low temperatures than many crop and pasture plants. Some forest trees—particularly spruce and fir—are grown successfully at altitudes of eleven or twelve thousand feet, where the mean summer temperature is about 48° F., as for instance in Colorado. An average annual temperature of 68° marks roughly the poleward limits of the palm tree, and therefore of tropical plants. Regions with mean temperatures of 50° or below for four months or more are beyond the limits of the oak tree, and therefore very largely beyond the limits of the temperate hardwood forest. Some trees will grow where there is frost in every month of the year, and some require comparatively little sunlight.

The distribution of the great commercial forest areas of the world bears no relationship to densities of population (see Figure 24). More than three-fifths of the softwood timber upon which the world depends for construction material is in North America and Europe, which contain only a third of the world's people. China and India, with nearly a billion people, embrace less than three per cent of the world's forests, while sparsely populated South America contains nearly 30 per cent.[4] This disparity in the distribution of forests and populations causes many nations to have less forest area per capita than the minimum needed to provide for cooking and warmth, even at most primitive levels. This minimum is about an acre, but India

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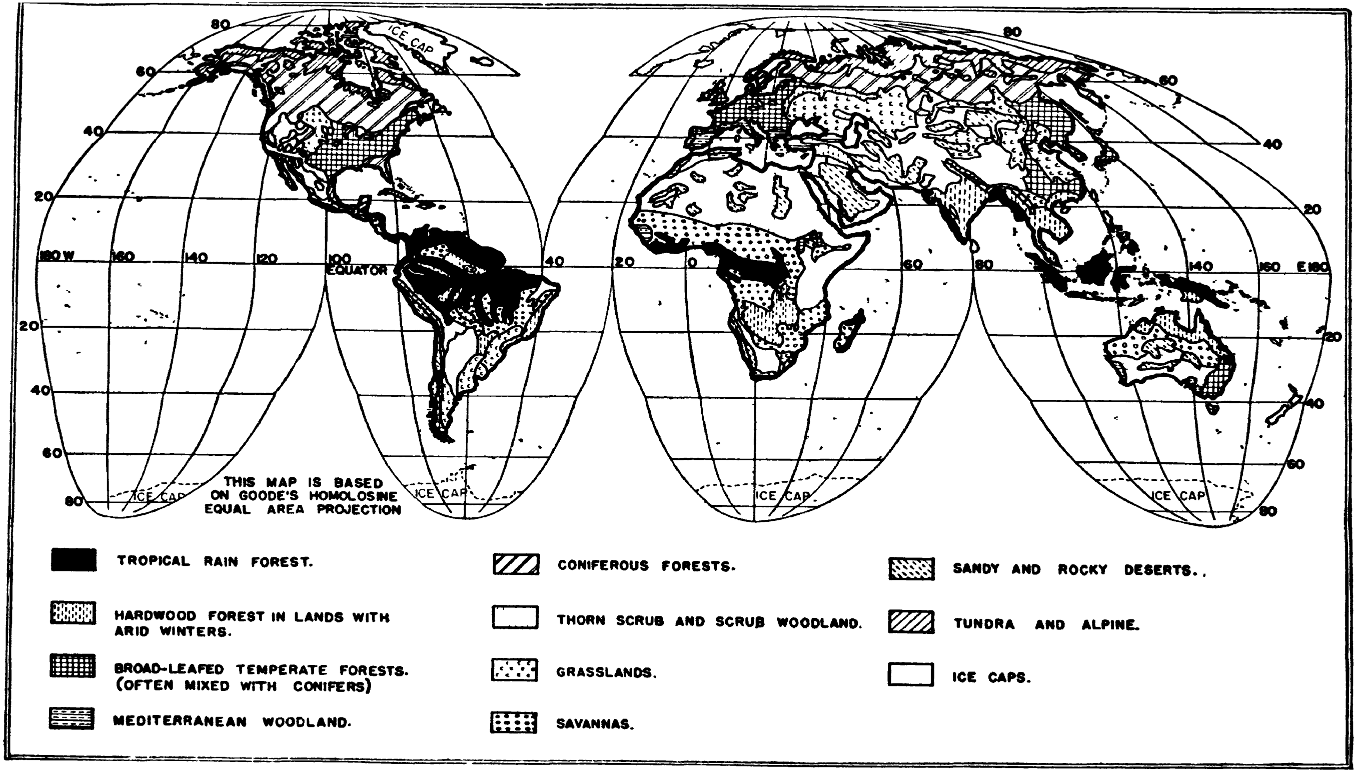
[4] See "Third Report to the Governments of the United Nations," p. 16. By continents the distribution of forest lands is: Asia, 28 per cent; South America, 28 per cent; North America, 19.3 per cent; Africa, 10.6 per cent; Europe, 10.3 per cent; Australia and Oceania, 3.8 per cent. (See R. Zon and W. N. Sparhawk, "America and the World's Woodpile," U. S. Department of Agriculture Circular 21, January 1928, p. 5.)


80
60
40
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180 W
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140
120
100
EQUATOR
40
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0
60
80
140
160
E180
ICE CAP
THIS MAP IS BASED ON GOODE'S HOMOLOSINE EQUAL AREA PROJECTION
TROPICAL RAIN FOREST.
HARDWOOD FOREST IN LANDS WITH ARID WINTERS.
BROAD-LEAFED TEMPERATE FORESTS. (OFTEN MIXED WITH CONIFERS)
MEDITERRANEAN WOODLAND.
CONIFEROUS FORESTS.
THORN SCRUB AND SCRUB WOODLAND.
GRASSLANDS.
SAVANNAS.
SANDY AND ROCKY DESERTS..
TUNDRA AND ALPINE.
ICE CAPS.

FIGURE 24. Natural Vegetation of the World. (Adapted from L. E. Klimm, O. P. Starkey and N. F. Hall, *Introductory Economic Geography*, Harcourt, Brace 1937.)

and the Netherlands have less than this, China less than half an acre, and Syria and Palestine about two-tenths of an acre per person, while at the other extreme Canada has fifty acres per capita.[5]

Forests are a resource which man has been able to destroy very readily. In many instances, forests have been a hindrance or obstacle to be overcome in the development of lands for agricultural use. Consequently, present forest resources of the earth do not often occupy the original forested area, much of which has been cut over. For example, in the United States, forests orginally covered more than 822 million acres (see Figure 25), of which some five-sixths has been cut over, only a little more than 138 million acres of virgin timber remaining. More than 350 million acres have been permanently cleared and transferred to other uses.

Although forests, excluding arid woodland (piñon-juniper and chaparral), originally covered more than 822 million acres, only about 630 million acres in the United States now grow trees. Nearly three-fourths (462 million acres) of this forest land is capable of producing commercial timber.[6] Significant amounts of commercial forest land are found in all regions except the Plains. The South, with 203 million acres, is by far the most important region in terms of acreage; the Columbia River Basin, including the Douglas fir belt of western Oregon and Washington, is second with 74 million acres; the northeastern region contains nearly 60 million acres, and the lake region, 52 million. The southern Rocky Mountain region contains about 31 million acres, the central region nearly the same amount. and the California area about 14 million acres. The Plains region contains only 14 thousand acres of commercial forest lands. Thus, in terms of acreage, nearly three-fourths of the commercial forest land is east of the Plains, in the area which contains over four-fifths of the people.

In terms of board feet or the amount of saw timber, the Columbia River Basin is by far the most important with 883 billion board feet or approximately half the total stand of saw timber of the country (1764 billion board feet). The South has 387 billion board feet or nearly a fourth of the total, California has 213 billion or an eighth, the South Rocky Mountain region 125 billion, the northeastern 84, the lake states 48, the central region 14, and the Plains states only 35

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[5] See "Third Report," *op. cit.*, p. 16.

[6] R. D. Marsh, and W. H. Gibbons, "Forest Resource Conservation," U. S. Department of Agriculture *Yearbook*, 1940, p. 459.

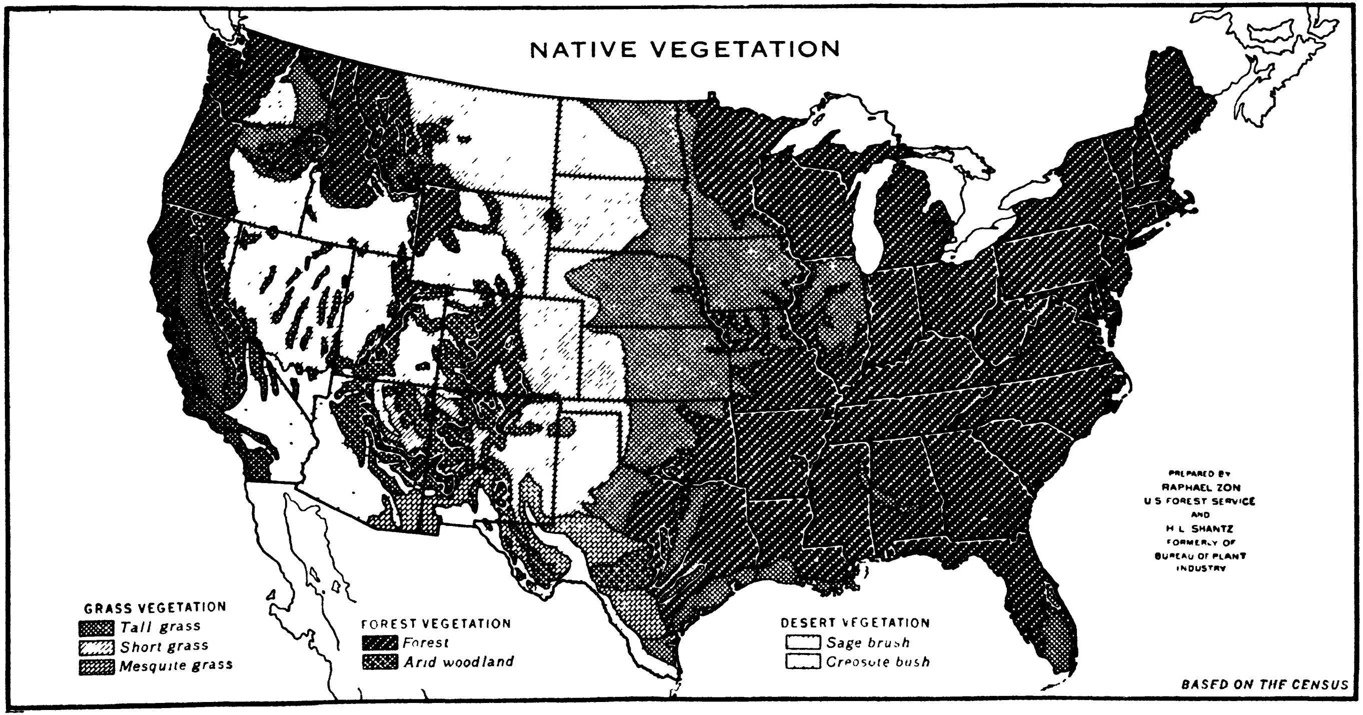

Figure 25. Natural Vegetation of the United States. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

million board feet. Thus, in terms of board feet of saw timber the situation is the reverse of that of acres of commercial forest land, three-fifths of the stand of saw timber of the nation being located in the area west of the Plains, which contains less than a fifth of the people.

COSTS AND RETURNS IN FORESTRY

Forestry may be defined as the handling of forest land in such a way that it will raise repeated crops of timber and related products and exert the greatest possible beneficial influence on soil and stream flow, wildlife, and human life. Where sustained yield practices are followed and selective cutting and reforestation are practiced, forest resources are maintained at a fairly uniform level. On the other hand, where forests are treated as though they were mines to be exploited, timber is cut off and, with no systematic reforestation, unproductive, cut-over stump areas with little value for other uses remain. Where exploitative lumbering has occurred, serious land use problems have resulted from the shrinkage of the forest resource which had formerly supported a considerable amount of employment in lumber production. One of the best examples of the consequences of forest exploitation is in the cut-over areas of the northern lake states, where submarginal farm units, heavy tax delinquency, farm mortagage foreclosures, and high rural relief costs predominate.

Types of Forests. Forests may be divided into *natural* and *cultivated* or artificial forests. The best examples of natural forests are the primeval or virgin forests, while the best examples of artificial or cultivated forests are those which have been planted and cultivated by man. There are, of course, many variations between these two extremes, all of which are influenced more or less by man. For example, second-growth forests (or third-, fourth-, or other growths) are frequently the result of spontaneous reseeding and natural growth where man has established sufficient corrective and protective measures to bring back a forest cover. Thus, the forest is a joint product of natural forces and human efforts. However, natural reproduction after clean cutting often results in dominance of other and less desirable species than those dominant in the original forest. In areas where natural conditions do not favor natural reproduction, artificial replanting and careful cultivation must be employed for successful reforestation. This is frequently the case in many regions of Europe, and is due not only to the character of natural conditions predominating in these areas, but also to economic and institutional factors. In the United States, very few forest areas can be considered cultivated or artificial.

In many forest areas where the trees represent the natural stand and frequently the original or virgin forest, good forestry practices involve selective cutting of mature trees, and piling of brush and slash for disposal. Good harvesting practices which permit securing the greatest possible amount of timber from each tree by cutting low stumps and using as much of the tops as possible also increase efficiency of forest use.

Nearly four-fifths of the commercial forest area of the United States is owned privately; and of this privately owned land approximately one-third is in farm woodlots, the remaining two-thirds being owned principally by private corporations. Most of these privately owned commercial forests have been and are being exploited rapidly without any program of sustained-yield management. This applies not only to virgin forest areas, but even to second-growth forests. The one-fifth owned publicly consists largely of lands in national forests, with relatively minor areas owned by state, county, and municipal governments.

Costs in Forest Operation. If virgin forests or forests where growth has already matured are handled on an exploitative basis, no costs are involved, aside from cutting or harvesting expenses, except interest, taxes, and protection costs. Where land is being reforested and young trees are growing on the land, or where sustained-yield management has been effected for an area already covered with mature trees, additional costs are involved. Costs of intensive forestry on a sustained-yield management basis vary considerably. Representative costs run from as low as 37¢ per acre per year in the case of typical second-growth turpentine forests in the South to as much as $1.13 for eastern white pine forests.[7] As a general rule, a minimum of about 50¢ may be taken as fairly representative; ordinarily, costs will not exceed a dollar even for the higher cost forests. However, interest is not included in these figures, and interest charges are usually a large cost item.

Interest should be figured not only upon the estimated per acre

[7] See "A National Plan for American Forestry," U. S. Sen. Doc. 12, 73rd Congress, First Session, Government Printing Office, 1933, vol. 2, p. 1320.

value of the forest stand, but also upon the amount invested in bare land values and funds invested in taxes, protection, and timber management. It can readily be seen that interest charges are a very significant item in forest operations, particularly when it is recalled that more than fifty years, and sometimes as many as two hundred years, are ordinarily required to mature a stand of trees. For example, stumpage value per acre of fully stocked thirty-year-old white pine in New Hampshire is $56 on good sites, increasing to $295 per acre at 50 years, $583 at 80 years and $678 per acre at 90 years. In the case of loblolly pine in North Carolina, stumpage value per acre on good sites increases from $79 at 30 years to $305 at 80 years.[8] These data give some idea of the importance of interest in the carrying charges of forest operation. Assuming an average $300 per acre stumpage value (which would not be excessive for many forests), interest charges alone would amount to $15 per acre annually, with an interest rate of 5 per cent. To these interest charges must be added interest on investment in the bare land itself and on forest improvements. The main elements of the fixed capital investment in forestry are soil, forest improvements, and growing stock or standing trees. The proportions of capital investment which these elements represent vary, but average about as follows: soil, 0–5 per cent; forest improvement, 5–15 per cent; and forest growing stock, 80–95 per cent.[9]

Returns from Forest Operation. Income from forest operation may be from: (1) sale of saw logs or timber; (2) sale of pulpwood; (3) sale of posts and poles; (4) grazing; (5) recreation; (6) miscellaneous products such as turpentine, game, etc. Timber is ordinarily the principal source of revenue to forest owners, although the recent development of the pulpwood industry makes the sales of pulpwood the major source of income for southern forests. For the United States as a whole and for most other nations which have commercially important forests, lumber production is the most important single source of revenue.

In the United States, forest properties held especially for timber (either as virgin forests, second-growth, or artifically grown stands), have appeared unattractive as sustained revenue producers. The competitive marketing of forest products resulting from overrapid exploitation of virgin stands has done much to prevent conservative cutting on many privately owned forests, and in public forests has prevented relatively inaccessible timber from coming into production, thus deferring financial returns from it.[10] Overrapid exploitation has been attributable largely to the relatively heavy carrying charges which must be deducted from income from privately owned forests. Heavy interest and tax charges have made it unprofitable to hold forest properties for any considerable period.

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[8] F. R. Fairchild, *et al.*, "Forest Taxation in the United States," U. S. Department of Agriculture, Miscellaneous Publication 218, October 1935, pp. 239 ff.

[9] *A National Plan for American Forestry*, vol. I, p. 893.

Recent studies of forest yields and average incomes which can be secured on a sustained-yield basis indicate that in many areas carrying costs (protection costs, taxes, interest charges, and timber management expenses) are so great that little, if anything, is left from receipts. In some cases, taxes assessed annually against the land are practically equal to the entire average annual forest income, and occasionally exceed it,[11] leaving virtually nothing with which the owner can pay timber management costs and expenses of fire, insect, and disease protection, to say nothing of interest charges on borrowed capital or interest earnings on his capital investment.[12] Under these conditions, the forest owner will cut off his timber stand, secure what income he can, and abandon the barren, cut-over stump land, letting it go tax-delinquent and eventually revert to public ownership or become a part of submarginal "stump" farms.

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[10] *Ibid.*, vol. II, p. 1321.

[11] For example, in Flathead County, Montana, the U. S. Forest Service estimates that the average stand of timber will produce from 10,000 to 15,000 board feet an acre. If it is assumed that this timber could be grown in a sixty-year period, the annual average yield or growth would be approximately 250 board feet. Stumpage values for fir, larch, and western white pine in this area range from about $1 to $1.50 per thousand board feet of log scaled on the stump, so that the average annual growth would yield a return of about 25 or 30 cents. In other words, under sustained yield management, the forest owner could, over a period of years, afford to own the land as a private individual or corporation only if annual costs of operating the land were less than 25 or 30 cents an acre. Timber lands in Flathead County are assessed taxes at an average of approximately 25 cents per acre. Thus, tax charges are such as to consume practically the entire average annual return from timber sales in this area.

[12] Forest growth varies greatly among different species of trees and different areas of the nation. For example, the white pine of New England will yield 50,000 board feet in 60 years, while New England red spruce yields only about 13,000 board feet. In the lake states, northern white pine yields more than 35,000 board feet, while jack pine yields only about 11,000. In the South, loblolly, shortleaf, and slash pine average from 30,000 to 40,000 board feet of growth per acre in 60 years. In the northern Rocky Mountain area, ponderosa pine yields about 15,000 board feet, and western white pine more than 20,000 board feet in 60 years. The Douglas fir forests of the Pacific Northwest will yield more than 65,000 board feet at 60 years; and California forest area yields per acre at 60 years vary from 36,500 board feet for white fir and about 57,000 for Douglas fir to 115,000 board feet for the redwoods (see "National Plan," p. 903). Average production over entire forest properties cannot be

In some areas, private forest owners may be able to secure additional revenue through grazing their forests. In the case of private farm woodlots, the value of grazing per head of stock reaches its highest level. It is true that excessive grazing will reduce timber returns from forests, but under proper management, grazing constitutes a very legitimate and appreciable source of revenue. In some areas, recreational use of private forests is increasing and can be made to yield some revenue, with proper management. Revenue may also be possible from development of hunting and fishing facilities on some private forest land, and revenue from naval stores and minor forest products is large in some localities.

It is estimated that for the United States as a whole some $40,000,000 worth of naval stores are produced from forest products annually. An additional $10,000,000 of tanning materials, $10,000,000 of nuts, $5,000,000 of maple sirup and sugar, $3,000,000 of distillation wood, $2,000,000 of Christmas trees and greenery, and $1,500,000 of pharmaceuticals and oils are produced annually, making a total of $71,000,000. The estimated total annual value of forest products at the point of utilization or distribution is nearly $793,500,000. Logs for lumber and other sawed products amount to $300,000,000 annually, fuel wood $240,000,000, fence posts $80,000,000, pulpwood $50,000,000, veneer logs $20,000,000, hewed ties $18,000,000, poles $10,000,000, and piling $4,000,000.[13]

Forced liquidation of commercial timber stands caused by excessive carrying costs has been rather general in many areas in the United States. This same situation has precluded private production of new timber crops on cut-over lands, which would take from sixty to a hundred years. High carrying costs have been an extremely significant factor accounting for forest depletion in the United States during the past several decades.

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expected to exceed 60 to 75 per cent of the above growth rates, which are based on fully stocked stands. Thus, taking about two-thirds of the above yields and dividing by 60 will give the average annual yield or growth of the forests.

[13] U. S. Department of Agriculture, "Living and Forest Lands," Miscellaneous Publication 388, p. 41.

Forest Management. In recent years, particularly during the past decade, there have been significant improvements in management of privately owned forest lands. Important gains have been made through fire protection organized with federal and state cooperation. The example of good forest management set by the national forests, the research and extension efforts of federal and state governments, and the general influence of the conservation movement (which grew stronger during the depression thirties) have also been important factors contributing to improved management practices on privately owned forest lands. Many private owners are sincerely attempting to manage their forests like a crop instead of a mine, despite serious economic handicaps. It is estimated that of the 202 million acres of commercial forest land in industrial and other non-farm private holdings, some 29 million are under some form of management.[14]

Nearly a third of the 139 million acres in farm woodlots (about 41 million acres) has been put under some form of management.[15]

Publicly owned forest lands do not operate under difficulties of overhead costs, particularly heavy taxes and interest charges common to private owners, and generally have had some form of effective forest management, varying from intensive sustained yield to fire protection. Much of the national forest area has been placed on a sustained-yield basis, and many community forests (owned by counties, cities, towns, hospitals, or schools) have had excellent sustained-yield management. Most state forests are protected against fire and trespass, and on many cutting is permitted, with or without restrictions.

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[14] Four million acres under intensive sustained-yield management, 7.5 million under extensive sustained-yield management, and 17 million under extensive management without sustained yield. However, some 37 million acres (about a fifth) are not under any form of management, although being restocked poorly or not at all; and 137 million are unmanaged but at least partly productive. Some 60 million acres are without fire protection. (See Marsh and Gibbons, *op. cit.*, p. 470; and "Forest Lands of the United States," Sen. Doc. 32, 77th Congress, First Session, Government Printing Office, 1941, p. 25.)

[15] Less than 2 million acres are under sustained-yield management, 9.7 million under extensive sustained-yield management, and 30 million under extensive management without sustained yield. Some 20 million acres are still to be restocked, and about 75 million acres of deteriorated forests must be rehabilitated if production is to be increased to a reasonable level. Approximately 40 million acres are without organized fire protection. (See Marsh and Gibbons, *op. cit.*, p. 469, and "Forest Lands of the United States," *op. cit.*, p. 22.)

PECULIARITIES OF FORESTRY AND LANDS IN FOREST USE

A forest is something more than a mere group of trees. It is a highly organized community of plants and animals living in close association, and with varying degrees of interdependence.[16] As a result, forest land serves at least five major purposes, each of which is essential for human living in modern economies. These major purposes are: (1) timber production, (2) watershed services, (3) recreation, (4) support of wildlife, and (5) forage production.[17] In addition, forests produce food and many products useful to man, including camphor, turpentine, rosin, and cork.

A Multiple-Use Resource. These major uses are not necessarily mutually exclusive, and in many cases forest land is used simultaneously for two or more of them. Forest land is thus distinctly different from agricultural land, where each major crop or enterprise use is mutually exclusive. Some idea of the nature and extent of the multiple-use quality of forest land in the United States can be obtained from the following acreages useful for different purposes:[18] (1) Commercial timber can be grown on some 462 million acres out of 630 million acres of forest land in the United States. (2) Approximately three-fourths of all forest land exerts a favorable influence on watershed protection and soil erosion control. (3) More than half (342 million acres) of the forest area, chiefly in the West and South, is grazed by domestic livestock. (4) Almost all the area is suitable for wildlife. (5) Eleven million acres of land naturally suitable for timber use have been set aside exclusively for scenic purposes and recreation in the form of parks, monuments, and other reservations; much of the rest can also be used for recreational purposes.

The multiple-use aspects of forest land make forests particularly beneficial to man; but, on the other hand, competition between uses for control of the forest may likewise create serious economic problems. For example, use of the forest for game and wildlife may compete with its use for grazing livestock. Properly managed, competition between wildlife use and grazing use can be reduced so that sportsmen and ranchers may both benefit significantly from forest lands. The most important factor determining the competitive nature of these various uses is the character of the forest ownership; but regardless of who owns it, different types of use must be coordinated and adjusted if optimum benefits are to be secured.

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[16] M. F. Heisley, "Our Forests: What They Are And What They Mean To Us," U. S. Department of Agriculture, Miscellaneous Publication 162, July 1940, p. 2.

[17] Marsh and Gibbons, *op. cit.*, p. 461.

[18] Data showing acreages and proportions of U. S. forest land used for various purposes have been taken from *ibid.*, p. 461.

Except in areas where forest tracts are used to protect municipal watersheds (watersheds supplying water for human consumption in urban areas) forest land need not be withheld from other use for the sake of the watershed protection function. From national forest lands alone comes domestic water for more than 6 million people. Most forest lands have some recreational value, but some have such exceptional recreational value that they should be withdrawn from timber or grazing use. The U. S. Forest Service has, in recent years, excluded all other uses from certain "primitive areas" and devoted them exclusively to recreation. However, many forests producing timber under proper management also constitute excellent recreational areas. More than 30 million people each year use the national forests for recreation.

Time Element in Production. Perhaps the most significant feature of forestry is the long time required to bring a forest to maturity or to profitable production. The time element does not enter into the utilization of virgin timber stands—which even now are responsible for most of the world's supply of commercial forest products—except to influence the size of trees and the general character of the forest itself. For the most part, virgin forests consist of mature trees. However, in determining the general desirability of devoting a given piece of land to forests or some other use, or in determining the relative desirability of public or private ownership, the time element is very important. The length of time required to mature a crop of trees depends on many factors, most important of which are the climate, the soil, and the species of tree (some trees grow much faster than others). Trees are a crop, and depend upon much the same basic soil and climatic factors for their rate of growth as does agriculture. Softwoods mature in 30 to 50 years, while some of the hardwoods require more than 200 years to mature to saw-log size (18-inch trees). This long time factor helps to determine the types of tenure, taxation, and use-control policies and programs which are best adapted to forest land.

A Large-Scale Business. Another very important characteristic of forestry is the size of the area which constitutes an efficient minimum-sized operating unit. A few trees planted here and there, or a few growing separately, do not make a forest. Farm woodlots cannot be considered forests in the strict sense of the word, although they do yield much fuel, timber, and lumber. A forest is usually thought of as much larger in size than an acre or a few acres, and is composed of trees crowding each other in such a way that uniformly shaped trunks result. Trees in a forest crowd each other and kill out the weaker members; lower branches are also killed, because of their inability to get sunlight; and a long, straight trunk free from knots. almost cylindrical in shape, and sometimes more than a hundred feet long is produced. The lumberman can use logs of this type most efficiently.

A real forest. to produce the best lumber, must be one of considerable area. and efficient use of sawmills requires large tracts. These facts have important economic consequences. The average individual is not able to handle the financial obligation of operating such a large area, and this, combined with the length of time required to mature a forest, makes public or corporate ownership much more general than private, individual ownership and operation.

Flexibility of Operations. Forest industries possess a fair degree of flexibility, because forests have no one harvest period as do most agricultural crops. Trees may be harvested when very young for Christmas trees, fence posts, or firewood, or harvested later for telegraph poles, railroad ties, or building logs, or harvested at a still later stage for saw logs and lumber production. In other words, the forest operator has a considerable range of time over which he can harvest his "crop" of trees.

The flexibility which this choice gives the forest operator is evidenced by the behavior of the lumber industry during the world-wide economic crisis which began in 1929. Lumber manufacturers were better able to adapt output to declining demand than the operators of the great majority of staple industries were. Lumbering can be suspended altogether for a year or so without any significant damage to the forest, which simply goes on growing. Mature trees may stand for several years, in many cases, before beginning to decay or depreciate in value. If the forest operator has the financial resources, he has an unusually favorable natural situation which enables him to adapt production to a fluctuating demand. However, like most commercial production, the lumber industry is ordinarily interested in maintaining a fairly uniform production level.

The flexibility of forest production is increased by the fact that the forester can store his products "on the stump," as it were, without the storage costs, depreciation, and risk of price changes that affect most agricultural crops. When forest operations are largely of a mining character—that is, when virgin forests are cut without any effort at regeneration or maintenance—this flexibility is particularly pronounced. However, under sustained-yield management, cutting quotas are computed as a definite proportion of forest stand annually, but cutting quotas for several years may be grouped to meet market conditions. It is this situation which has led forestry students to believe that a lower rate of return is justified for forest investments than for business investments generally.[19]

Importance of Natural Factors. Nature plays a more important role in forestry than in agriculture. Trees cannot be "bred" in the same sense that new varieties of crops and animals have been produced, nor can their growth be increased significantly through cultivation. The forester, therefore, merely guides tree growth, thinning where needed, removing dead trees, and protecting the forest against fire and disease.[20] It is true that trees can grow on poor or rough land which is often submarginal for agriculture, so that the cost of the land factor is relatively low. Moreover, as the forest matures, the trees become a more important capital good than the land. In other words, instead of harvesting a crop each year, the forester harvests one large crop—ordinarily after many years of tree growth—so that in each successful year the value of each previous year's growth is accumulated in the form of an increasingly valuable timber resource. The policy of taxing the total value of the forest stand each year until it is harvested, although there is only one income period (especially for virgin stands), has tended to cause premature cutting and creation of non-reforested cut-over lands that have reverted to public ownership through continued tax delinquency.

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[19] Franz Heske, *German Forestry*, Yale University Press, 1938, pp. 91–93.

[20] R. T. Ely and G. S. Wehrwein, *Land Economics*, Macmillan 1940, p. 284.

Demand Factors and Substitutes for Forest Products. No adequate substitutes are readily available for many agricultural products, particularly certain foods and fibers. In the case of many forest products, competition of other products that can be substituted is much more acute. Rising industrialism and progressive mechanization have caused a decided shift from organic to inorganic substances, especially from wood to metal. In spite of the increased use of metal products, however, there is still a heavy demand for forest products throughout the world, and particularly in the United States. The use of wood for paper production in the United States is now three times as large as it was a quarter of a century ago. The important thing about the demand for forest products is its dynamic nature, in comparison with the more stable demand for certain agricultural products which are necessities of life.

The more dynamic the demand for forest products, the less stable, less predictable, and more sensitive to certain economic and social changes it will be, with the result that greater economic risks are involved in successful marketing of forest products than in marketing products for which the demand is more stable. The fact that the annual supply of forest products can be adjusted more easily to changing demand conditions is an important offset to the economic disadvantages of the more dynamic demand for forest products.

FUTURE FOREST LAND REQUIREMENTS AND RESOURCES

The area of forest lands in the United States is approximately 630 million acres. Whether the amount of land devoted to forest use in the future will be more or less than this acreage depends upon a great variety of supply and demand conditions. How many acres under various levels of intensive and extensive management will be needed to meet the demands for forest products in the years ahead? Is the consumption of forest products declining because of the use of wood substitutes, declining birth rates, and related demand factors, or is the use of forest products increasing? In order to meet the demands of the future, how much of the total acreage suitable for forest use in the United States will probably be devoted to forestry? In competition with other uses for these lands, will forestry secure them, or will our domestic requirements be met by importing forests products from other nations which may be able to supply them at a cost lower than that at which we could produce them ourselves? Will we follow a policy in the years ahead of trying to build up and maintain our forest resources so that the annual drain to meet current requirements will be offset or more than equaled by the annual growth?

There are many unpredictable factors which make appraisal of the future requirements for forest products for any given nation difficult. However, from certain data available showing current trends regarding availability of land for forestry and the probable acreage which will be needed for forest uses, some close approximation can be made of the supply and demand requirements for balancing the timber budget of any given nation.

Total Area Available for Forestry. In an absolute sense, the total area available for forestry in any given nation is the total acreage which is physically capable of growing trees. However, the economic supply which will be available for forest use will depend upon the character of the competition among various types of utilization such as agricultural, transportation, recreation, mineral, and urban. As a rule, forestry secures those lands which are not suitable for agricultural production or which, because of competition within agriculture, are submarginal for production of crops and pasture.

Ordinarily, forestry is the least intensive use which can be made of land and will, in the last analysis, secure the use of those lands which do not find their highest and best use in any of the other major use types. Agricultural use is ordinarily the next lowest use compared with transportation, recreation, mining, and urban utilization. Consequently, it is fairly safe to predict that within a given nation the area which will be available for forestry will be that which, through competitive processes with other land uses, currently is used for forests, plus the increase or decrease in this area which is likely to accompany the future utilization of land for agricultural purposes. In some countries, the demand for agricultural products is such that the areas devoted to agricultural use will increase at the expense of forest lands in the years ahead. In many areas, clearing of forested areas will occur and the lands will not be reforested but used for agricultural production. In other areas, however, advancing technology, declining population trends, changes in diet, and associated factors and conditions will result in a reduced demand for agricultural land. In such cases some land will be released from agricultural use for forestry.

In a relatively young nation like Canada, considerable cutting of forests will continue in the future and much of the land will probably be put into agriculture and other non-forest uses; but in a nation like the United States, where a considerable amount of agricultural land abandonment has already occurred, where forest areas have already been largely cut over or put into agricultural and other non-forest uses, and where the agricultural prospect is such that the future demand for farm products will probably require somewhat fewer rather than more acres, the forest area will probably expand.

The present forest area of the United States is approximately 630 million acres, or one and a half times greater than the farm cropland. It is estimated that an additional 54 million acres of abandoned agricultural land is available for forest use, making a total of about 684 million acres. If present trends continue for several decades, some 30 million acres more of agricultural land may become available for forestry, so that in the not-too-distant future it is conceivable that approximately 700 million acres of land may be devoted to forest use in the United States. The original forest area covered about 900 million acres, or slightly less than half the land surface of the nation, so that even with the most optimistic estimates for the next few decades, the forest land area will be considerably less than the original forested area, or the total acreage physically suitable for forest production.[21]

Land Needed for Forest Use. Will the above acreages be sufficient to meet the forest needs of the United States?

A study of timber statistics reveals a rather close relationship between per capita consumption and available supplies of timber. Timber requirements, as they may determine land requirements, are largely influenced by the available abundance or scarcity of timber, and of the land available for producing it. The United States is currently failing to balance its forest budget, not because there is a deficiency of forest land, but because of the failure to maintain forests in a productive or sustained-yield condition.

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[21] The data given apply only to continental United States. The total area of forests in Alaska is estimated at approximately 70 million acres, largely unexploited and representing a potential supply over and above the acreage data cited.

Lumber consumption in the United States reached a peak about 1906, with 45 billion board feet, or 525 board feet per capita, and has been decreasing since that time, in contrast to the trend of manufacturing and of population. Lumber consumption declined from the 1906 level to 36½ billion, or 275 board feet per capita, in 1929, the peak of prosperity and business activity following World War I. Consumption prior to World War II averaged about 32 billion board feet annually. This reduced consumption is due principally to the decline in lumber used directly in construction. A decline of almost a billion feet in factory use was offset by a comparable increase in sash, doors, and millwork. Decline in construction was due principally to a loss of 9½ billion feet in rural construction. This was partially offset by the increase in urban construction which accompanied the building boom of the late twenties. Rural construction is expected to recover to about 10 billion board feet annually; factory products, taken as a group, will continue to use approximately their current amounts; but urban construction, including sash, doors, and millwork, may not require more than ⅔ of the amount used in the late twenties. The tentative future United States normal lumber consumption, assuming that there is an adequate supply of timber to draw upon, is estimated to be about 32 billion board feet annually.[22] This amount may be increased considerably for several postwar years, because of the government's housing program, begun in 1946 to provide low cost houses for World War II veterans, and the large housing needs of the nation which accumulated during the war years when war priorities prevented home construction.

The use of wood for fuel has declined in recent decades, but it is generally felt that a low point has been reached and that the yearly fuel requirements of the United States may be roughly estimated as approximately 61 million cords, of which 42 million may be charged as a direct drain on the commercial forests of the nation.[23]

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[22] National Resources Planning Board, *op. cit.*, pp. 137–138. See also Marsh and Gibbons, *op. cit.*, p. 483.

The United States imports a considerable amount of its pulpwood requirements for paper production and other pulp products. In the late thirties, the United States imported an average of about 2 million long tons of wood pulp annually and produced domestically about 6 million tons. Ultimate self-sufficiency in pulpwood and a continuing upward trend in paper consumption will necessitate a large increase over present annual consumption of 8 million cords. It is estimated that future annual requirements for pulpwood will average 25 million cords annually, or 2500 million cubic feet of timber.[24]

Future requirements for miscellaneous forest products may be estimated at approximately the average consumption of recent years—namely, 2½ billion cubic feet yearly, because trends in consumption of miscellaneous forest products largely offset each other. Wood is one of the most flexible of organic products, and is adaptable to many uses. The uses of wood in a highly industrialized nation are constantly changing. Substitutes and competing materials take the place of wood in many of its uses, but on the other hand these competing materials may cause increased demand for wood in other forms. In other words, wood loses ground in some uses, but other new uses continually arise which expand the demands for wood. The logical tendency in a modern economy is for the demand for wood, particularly structural timber, to increase; but this tendency is definitely checked as supplies become more limited and prices increase.[25]

With increased emphasis being put upon sustained-yield management and proper forest protection from fires, insects, diseases, etc., it is estimated that losses from forest fires will be reduced in the future to approximately half the recent levels, and that losses from insects, disease, and related factors will be reduced by a fourth.[26]

[23] Marsh and Gibbons use a figure of 70 million cords as the estimated future annual drain for fuel wood. Although the present annual consumption is some 60 million cords, the development of farm forestry and improved wood-burning stoves may bring about an upward trend in the use of fuel wood. (*Ibid.*, p. 138.)

[24] *Loc. cit.*

[25] F. J. Hallauer, "Our National Timber Requirements," in "A National Plan," vol. I, pp. 245-297.

[26] National Resources Planning Board, *op. cit.*, p. 138.

The estimated total annual forest requirements are roughly 16½ billion cubic feet, or about 55 million board feet. This amount is approximately equal to the annual drain on U. S. forests for the period 1925–1929. A margin of safety of from three to five billion cubic feet to provide for possible future calamities, such as the recent chestnut blight which might wipe out entire species, and to provide for holding or increasing an export trade in forest products, and for new uses, should be added to the 16½ billion cubic feet as the estimated normal timber requirements.[27]

Relation of Current Growth to Drain. Timber production in the United States, under present conditions, is estimated to be about 11.3 billion cubic feet annually, in timber of all sizes, and approximately 32 billion board feet of saw timber, ⅔ of which is softwood. Thus, current annual timber growth on our present forest areas, allowing for the doubtful economic availability of some of the land and the commercial value of some species, is only about three-fifths of the probable future annual requirements. In order to increase the growth to meet future needs, a well-planned program of forest management must be effected. It is estimated that such a program applied to all forest lands of the U. S. would increase the annual growth from the present 11 billions to 21 billion cubic feet.[28]

This program should include a combination of intensive forestry, extensive forestry, and simple protection. Part of the shortage may be made up by natural restocking of available lands now lying idle, part by increasing the productive area by planting, including afforestation of some additional acreage of abandoned farm lands, but most of it will probably have to be brought about by building up the existing growing stock through better fire protection and more intensive management.

Students of forest economics recommend that since the most unsatisfactory aspect of our present forest situation, from the standpoint of timber use, is the tremendous impoverishment of growing stocks in the eastern regions, every advantage should be taken of the existing stands in the East, and they should be developed into adequate growing stock as the beginning and major part of a national forest land policy.

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[27] C. E. Behre and E. N. Munns, "The Area Which Can and Should Be Used for Forestry," in "National Plan," vol. 2, p. 1235. Behre and Munns use a billion cubic feet as a reasonable margin of safety; but Marsh and Gibbons use 3800 million as their margin for new uses, for export, and for a safety factor. Moreover, Marsh and Gibbons allow 2 billion cubic feet for losses from fire, insects, disease, etc., while the National Resources Board Report allows only 739 million cubic feet for these items (National Resources Planning Board, *op. cit.*, p. 138).

[28] This is the estimate of the Technical Committee on Forestry and Primary Forest Products of the United Nations Interim Commission on Food and Agriculture. See *News Release of U. S. Department of Agriculture,* Forest Service, Washington, D. C., August 25, 1945.

In the New England and Middle Atlantic regions, the present growing stock is only about 7/10 of that which would be required. In the lake, central, and southern sections, present stocks would have to be increased 2½ times. In the West, the existing stand is almost twice as great as the minimum needed, but because of the large volume in mature, non-growing forest, the surplus of growing stock is apparent rather than real.[29]

Balancing the Timber Budget. The management of areas available for commercial timber use in such a way as to build up the growing stock to assure an annual production equal to estimated normal requirements requires considerable intensification of management, even on the publicly owned lands. If the 85 million acres of commercial timber now in public ownership are handled according to the plan, intensive forestry must also be practiced on 62.3 million acres of private land, extensive forestry on 243.3 million, and in addition adequate fire protection on another 69.2 million acres. The distribution of these lands is shown in Figure 26.

Heavy emphasis should be placed upon improved management practices to secure sustained yield in the Middle Atlantic and southern regions. The South has many important advantages for forest use. It is an area well adapted to forest production from the standpoint of climate and soil, and produces a relatively rapid growth of types of timber which are commercially very valuable. Moreover, forests in the southern regions would be much closer to the large future consuming centers than forest areas on the Pacific Coast, where about a fourth of our present timber supplies are now secured. Moreover, the South has serious land use adjustment problems growing out of the declining export market for cotton, and

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[29] The ratios of present timber stand to actual growing stock required to maintain a growth of about 17½ billion cubic feet annually are as follows: New England, 0.9; Middle Atlantic, 0.6; Lake, 0.3; Central, 0.4; South, 0.4; Pacific 1.9; North Rocky Mountain, 1.6; South Rocky Mountain, 2.7 (all regions, weighted average, 0.8). (S. B. Show, "The Probable Future Distribution of Forest Land Ownership," in "A National Plan," vol. II, p. 1279.)

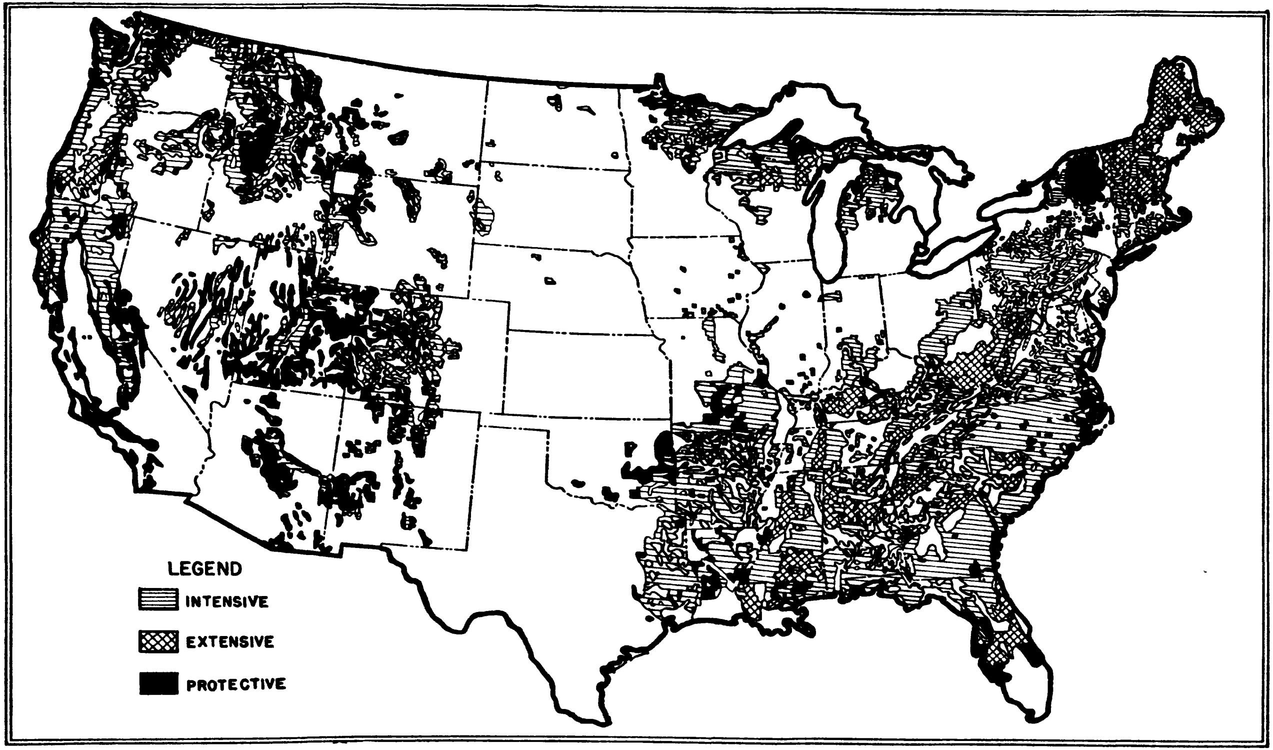

FIGURE 26. Recommended Dominant Intensity of Management of Forest Land in the United States. (Source: *Forest Land Resources, Requirements, Problems, and Policy,* National Resources Board, Government Printing Office, 1935.)

the necessity, from the standpoint of soil conservation and erosion control, of developing more diversified land use programs. On many of these lands, forestry will probably play a very important part in the future. Thus, it would seem that it is possible to plan a national forest program which will increase our forest production in those areas (principally the South) which are climatically well adapted for forest production, where needed land use adjustments are most acute, and in locations which will be relatively accessible to the large consuming areas.

The forest policy of any nation should include research and educational or extension activities which would look toward the improvement of forest management practices, discovery of new uses for forest products, encouragement of private effort for improvement, forest management by the diffusion of information concerning best forest practices, tree growth, silvicultural practices, and related matters. The McSweeney-McNary Act of 1928 included a large authorization for the support of the government forest experiment stations and laboratories, and provision for economic and industrial research greatly needed to lay the proper economic foundations for successful forestry. Under the Clarke-McNary Act, authority is given the federal government to cooperate with the states in extension work on woodland tracts, similar to the agricultural extension work now carried on by the land grant colleges. More than 25 colleges and universities in the United States and Canada offer courses in forestry, leading to a degree; and while these institutions vary greatly in character, financial support, and educational facilities, they form the nucleus of the units for training technical foresters.

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CHAPTER NINE

RECREATIONAL LAND

RECREATION, or the creative use of leisure, takes a great variety of forms among modern peoples. These forms express the needs, desires, qualities, interests, powers, and instincts of individuals. Recreation may be *passive,* such as complete rest and relaxation' without action; *mildly active,* such as viewing a beautiful landscape, walking or strolling, witnessing sports or games, or attending a dramatic performance; *active,* such as hiking, riding, hunting, fishing, camping, traveling, swimming, and participating in games and sports. Recreation brings immediate personal satisfaction or happiness and must always permit freedom of individual choice and freedom of individual action. Recreation may have and usually does have far-reaching beneficial results, both individual and social.[1]

NEED AND DEMAND FOR RECREATIONAL LAND

Americans spend a considerable portion of their time and wealth on leisure time activities. It has been estimated that the people of the United States spend more than ten billion dollars a year for recreation.[2] The desire for the kinds of recreation that lands of various types may provide is a natural and legitimate one, and amply justifies public and private agencies and individual owners assigning lands to recreational use.

Increasing Importance of Recreation. Recreation plays a much more important role in society today than ever before. This increased importance is due to a variety of causes, beginning with the Industrial Revolution which ushered in the age of leisure. Within the past century the hours of labor have been reduced from seventy-two per week to forty per week. The increasing division of labor and specialization, while expanding the productive efficiency of the average individual, restricts employment of his faculties. In the preindustrial era, a worker found use for a wide range of his faculties, and opportunity to stamp the product with his own genius. Man's creative impulses are usually thwarted in the modern factory, and his physiological balance is upset by the constant use of the accessory and the neglect of the large skeletal muscles.

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[1] See "Recreational Use of Land in the United States," *Report on Land Planning,* National Resources Board, Government Printing Office, Washington, D. C., 1938, Part XI, p. 3.

[2] Jesse Frederick Steiner, *Americans at Play,* McGraw-Hill, 1933, p. 183.

The growth of cities has accompanied modern factory production. Life is more artificial under urban than under rural conditions, and naturally there is greater demand for outdoor recreation to offset the more sedentary indoor work of urban living. It is significant that public recreation has had much greater growth in cities than in rural communities.[3]

Today 56 out of every 100 people of the United States live in towns of 2500 or larger. Thus, the country is definitely more urban than rural. Modern conditions of living in urban communities are in sharp contrast to those of frontier times. On the frontier there was no need for recreational land as such. Most of the people worked out-of-doors and there was ample land for all who wished to hunt, fish, or enjoy nature and the environment. The need for recreational land under modern urban conditions has resulted in (1) setting aside public lands for recreational use, such as national and state parks, forests and game refuges, and municipal playgrounds, and (2) an increase in privately owned land devoted primarily to recreation, such as dude ranches, summer camps, picnic grounds, commercial beaches, summer cottages, and country estates.

Place of Recreation as a Land Use. Approximately half of the 1,903,000,000 acres of land in the United States is physically adapted to the production of harvested farm crops for food, clothing, and other uses. Careful analysis indicates that this acreage plus limited pasturage of parts of the other half will be adequate to meet the needs of the prospective population indefinitely. The half that is poorly adapted to and not needed for farm crop production is not lacking in potentialities for social and economic services. A large part of this area should be permanently devoted to forestry; and to satisfy the needs of a population growing both in numbers and cultural standards, an adequate part should be dedicated to public service such as playgrounds, parks, monuments, and recreational areas.

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[3] For a more complete discussion of reasons for the rise of recreation see George Hjelte, *The Administration of Public Recreation*, Macmillan, 1940, pp. 4 8.

Recreational land is important not only because it brings in a considerable revenue but because it makes effective use of idle or waste lands and lands submarginal for agricultural purposes. Furthermore, recreational use of forested or mountainous districts unsuitable for agriculture does not prevent their use for forest purposes. Thus, recreational land uses in general may be considered complementary to agricultural and forest use, although lands with excellent scenic or location qualities may be utilized for recreation even though they possess unusually productive soils.

The recreational needs and demands of a progressive people cannot be met by certain prescribed areas specifically and primarily devoted to recreational use. They can be met only if all the resources of the country as a whole which are susceptible of use for recreation are developed and utilized. Resources of recreational value may be found almost anywhere, and if these resources are to be used most effectively, their use must be coordinated with other land uses. Consequently, the recreational function of the various forms of land use must be analyzed, evaluated in relation to other functions, and provided for by the various public and private agencies and individuals of the nation according to their different capacities and responsibilities.[4]

THE SUPPLY OF RECREATIONAL LAND

Like all other natural resources, recreational resources occur where nature has scattered them, and without any orderly relationship to human demand. Physical factors play an important role in determining suitability of land for recreational use just as they do in the case of agricultural and forest lands; but the relative importance of the various factors is considerably different and they operate within more definite limitations of geographical factors than in the case of agricultural and forest lands.

Factors Determining Suitability of Land for Recreation. The nature of the population and the pattern of its distribution are of major importance in locating areas that are to be used wholly or partly for recreation. A group of natural factors, principal of which

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[4] Cf. "Recreational Use of Land," p. 1.

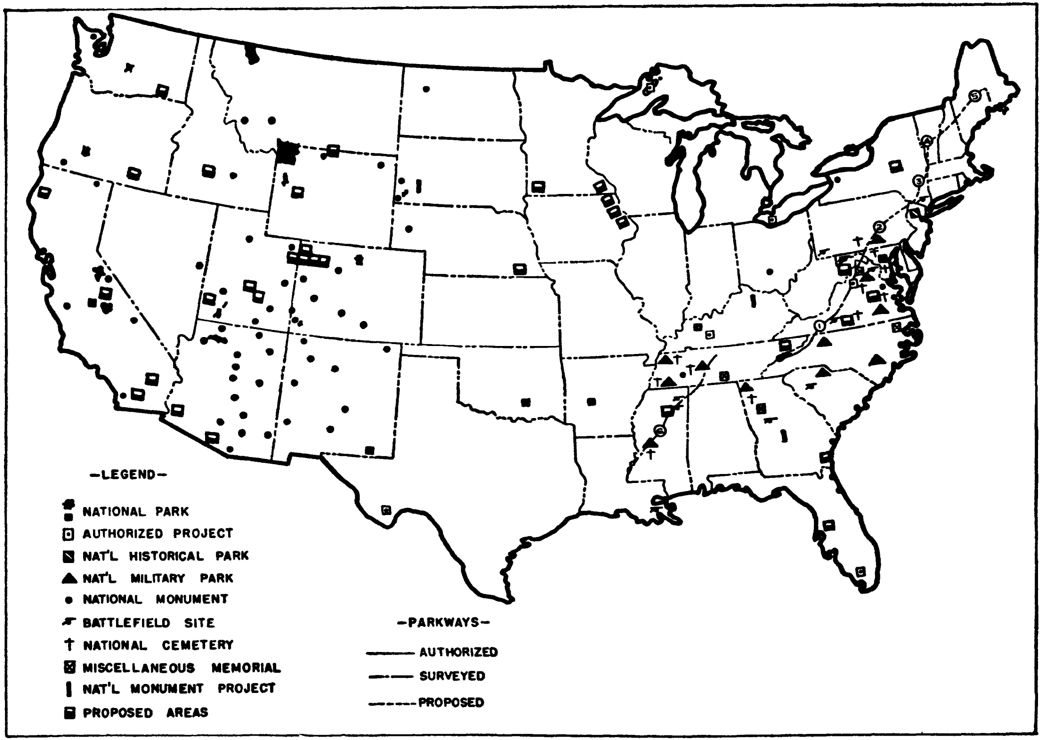

FIGURE 27. Present and Proposed National Parks. (Source: "Recreational Use of Land in the United States," Report No. 9, National Resources Board, Government Printing Office, 1938.)

are variety of elevation or topography, climate, water resources, and flora and fauna, exert a tremendous "pull" on population. The more favorable these natural factors, the stronger is their pull in determining recreational areas and facilities. They make any scheme based on a fixed pattern of distribution of recreational areas invalid in serving the needs of a culturally progressive people.

Land Relief. One of the most important determinants of the value of land for recreational purposes is *variety of elevation.* Mountainous or broken terrain with unusual geological formations has distinct advantages in the way of special scenic attractions and peculiar recreational opportunities, like skiing and mountain climbing. The whole of a plain is ordinarily in one life zone, whereas mountain acreages frequently include as many as five life zones giving a variety of flora and fauna.[5] Thus, the flat prairies of Iowa, although excellent for agriculture, do not have great recreational value, while the rugged Rocky Mountain slopes have practically no value for agriculture but have a great deal for scenic and recreational uses. A comparison of Figure 17 with Figure 27 showing present and proposed national park areas reveals how variety of land relief has been a determining factor in the selection of a majority of the national parks and monuments.

Persons planning vacation trips like to seek locations whose altitudes are opposite from those of their home environment, and the western mountainous country has great recreational appeal. The long distance to these areas from the large eastern population centers, however, is a considerable handicap to individuals with annual vacations of only two weeks or less than a month. During World War II transportation restrictions, gasoline rationing, and tire shortages reduced recreational use of the western areas to a minimum. The expansion of air transportation after the war will bring these recreational areas much closer to the eastern population centers in terms of time-distance and will contribute to a great expansion in their use.

Climate. Favorable precipitation, sunshine, humidity, and temperature, so important for physical comfort, are important factors in determining areas suitable for recreation. In fact, the chief motive of many recreational outings is the search for a pleasant climate.

Precipitation is a climatic factor of considerable significance in determining the seasonal value of certain regions for recreational use. For example, the light rainfall during the summer months in the Pacific Northwest makes this section one of the most delightful outdoor recreational areas in the nation. Light rainfall in the winter months contribute much to the recreational popularity of the Southwest, Florida, and California. In the mountainous areas where winter sports are popular, the amount of snowfall is important, although temperature is a more significant or limiting factor.

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[5] *Ibid.,* p. 42.

Almost a tenth of the land area of the United States has a rainfall of less than 10 inches a year (refer to Figure 19). This includes the great deserts in the Southwest. Many of these areas are warm during the winter, have a high percentage of sunshine, and are popular winter recreational and vacation areas.

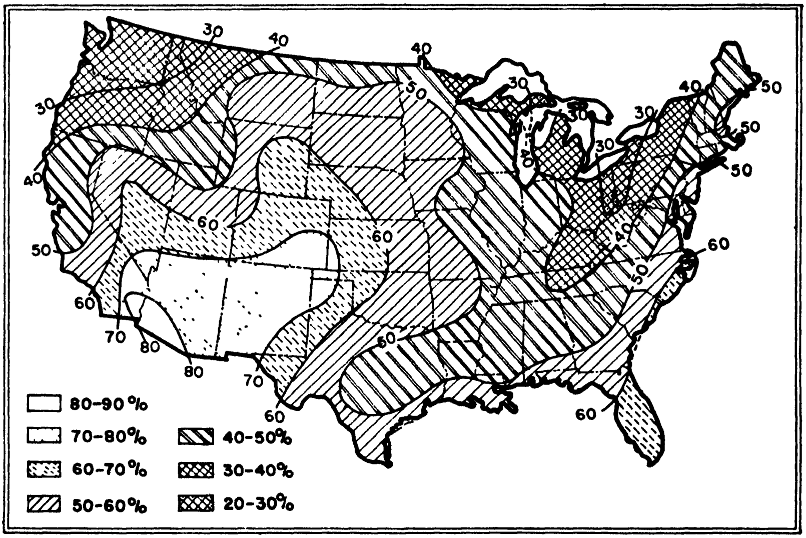

FIGURE 28. Average Per Cent Winter Sunshine in the United States. (Source: "Recreational Use of Land in the United States," Report No. 9, National Resources Board, Government Printing Office, 1938.)

Sections of the country having a high percentage of sunshine in the winter months are especially attractive for recreational use. Figure 28 shows the actual amount of sunshine expressed as a percentage of the total possible sunshine for the winter months for the United States. Any area having 60 per cent or more sunshine can be considered as possessing an important natural factor contributing to its desirability for winter recreational use.[6] It should be noted that the Southwest ranks high in this regard. Portions of Arizona and southern California have between 80 and 90 per cent of their total possible sunshine for this period. This, combined with warm winter temperatures, makes these areas popular winter recreation spots. Florida is also a popular winter resort for much the same reasons. It is unfortunate that winter sunshine areas are remote from greatest population centers because most Americans cannot take advantage of them at a time of year when sunshine can contribute so much to good health.

Humidity, or the amount of moisture in the atmosphere, is an important factor in the geography of recreation. High humidity during the summer months when temperatures are relatively high prevents many otherwise desirable areas, like the Chesapeake Bay region, from being ideal summer recreational areas. Low humidity (dry atmosphere) areas are much more comfortable in both summer and winter, summer temperatures being much less depressing and low winter temperatures less chilling and penetrating. The major low humidity areas of the United States are the Southwest and Great Plains regions. They are not available to the great majority of Americans because of their remoteness from heavily populated centers.

Low temperatures in summer and high temperatures in winter are favorable factors in determining suitability of an area for recreational use. Mountain areas are popular in summer and southern areas in winter chiefly because of the low summer temperatures of the former and the relatively high winter temperatures of the latter.

Average July and January temperatures of the United States are shown in Figure 29. It is apparent that the areas of densest population, with only limited recreational resources available, have unfavorable summer and winter temperatures. Consequently, those who seek cool summers and warm winters must travel long distances. For summer recreation areas, those having July temperatures averaging between 50° and 60° are greatly desired. These areas occur throughout the Rocky Mountains, the Cascade, and the Sierra Nevada ranges, located in the far western part of the nation. For winter recreation areas, those having average January temperatures between 50° and 60° are very desirable. All of the Gulf states, southern California, and Arizona contain such areas and are popular

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[6] *Ibid.*, p. 45.

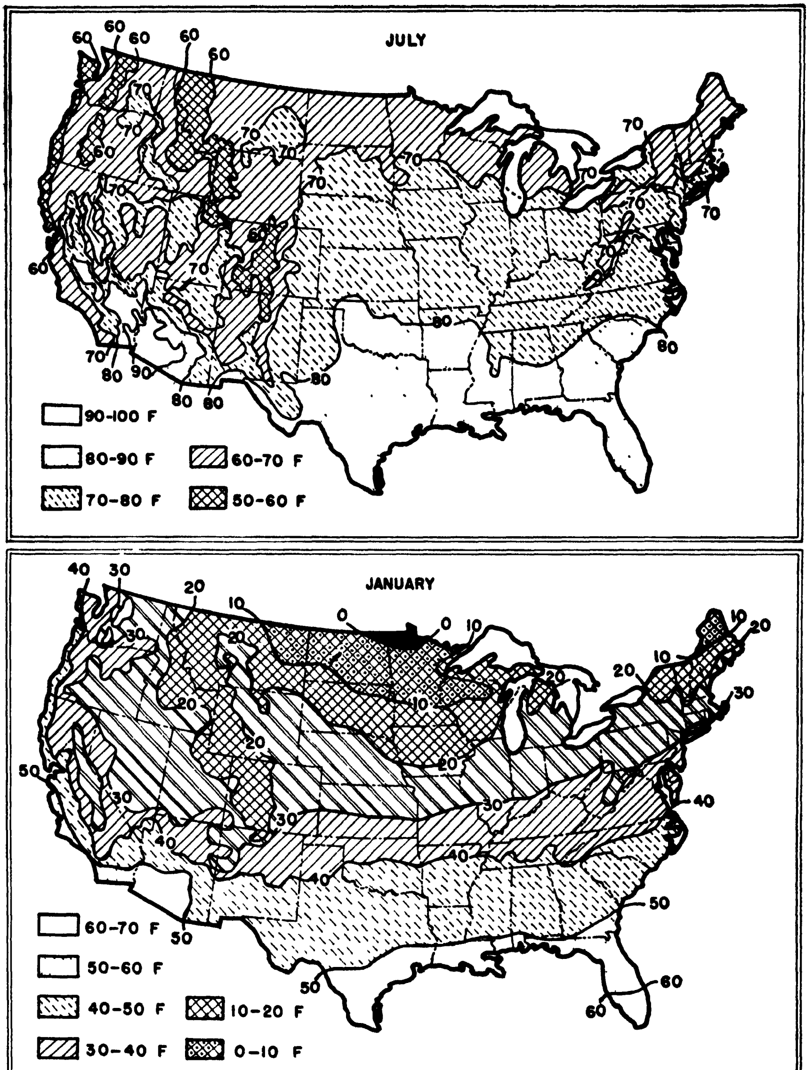

FIGURE 29. Average July and January Temperatures in the United States. (Source: "Recreational Use of Land in the United States," Report No. 9, National Resources Board, Government Printing Office, 1938.)

winter recreation spots. The southern half of the Florida peninsula has an average January temperature of 60° to 70° and, being convenient to the heavily populated eastern states, it is a great winter recreational ground.

Water Resources. Lakes, bays, oceans, waterfalls, and streams are significant factors in the recreational land use pattern. These water resources not only contribute beauty to the out-of-doors, but are themselves very useful for active recreation.

Lands with inadequate supplies of water have a low recreation acre value, just as they have a low agricultural acre value in arid areas. In recreational areas, greatest concentration of use occurs in the immediate vicinity of the water, and movement away from watercourses usually takes the form of excursions of relatively short duration.[7]

The recreational value of seacoasts and beaches is of the highest order. The shores of an ocean are an inspiring sight. Concentrated use of beaches does not destroy the feeling of intimate areas. Moreover, intensive use of beaches does not destroy their natural character.[8]

Twenty-one of the forty-eight states have ocean frontage and the total length of the seacoast of continental United States is almost 5000 miles. The total length of tidal shore line, including bodies of tidal waters more than a mile wide which lie close to the main waters, is nearly 12,000 miles. Beaches are one fortunate case of a recreational resource located near centers of greatest human demand. Forty-five per cent of the total U. S. population or about 60 million people, live within 55 miles of the seacoasts and the Great Lakes.[9]

Flora and Fauna. No area is recreationally complete without the living interest which plant and animal life provide. The importance of plant life is readily recognized in city parks, where a great deal of effort and funds are spent to establish and maintain trees and flowers. Forests and wooded areas greatly enhance recreational values of certain areas. They provide cool, shady retreats in summer, and habitats for birds and game animals. Where tree growth is luxuriant, relatively small areas have a high recreational use value.

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[7] *Ibid.*, p. 43.

[8] "Thousands of persons tread the sands and the next high tide effaces every evidence of their tracks." *Ibid.*, p. 43.

[9] *Ibid.*, p. 44.

Fortunately the Atlantic coast and Great Lakes areas are in this category and facilitate the task of providing recreation for the large populations of those regions.

In addition to the aesthetic enjoyment which colorful wild flower displays provide, and the restful effects of all forms of green vegetation, certain vegetative types have unusual recreational value because of their unique characteristics. Notable examples are the cacti of the southwest deserts and the interesting plants of the southern swamps.[10]

The variety, amount, and distribution of animal life are important factors determining the recreational value of land. The smaller forms of native wildlife, particularly birds, add appreciably to the value of the smallest recreational area such as a city park or residence yard. The larger wildlife species, including big game, require the large areas of their native habitat to survive. Agriculture, hunters, and trappers persistently encroach upon these big game or wildlife areas so that wildlife reservations with proper management are necessary.

Hunting is of great recreational importance in the United States. Americans love to hunt as a sport. The role of the hunter, important first in frontier days in gaining a livelihood, developed naturally through successive generations into a love of the chase as sport. For those who do not care to hunt, the urge for contact with primitive nature is satisfied by observing wildlife in its natural habitat, making detailed studies of life habits, or getting close-up photographs. The bears of Yellowstone National Park are an important factor in attracting tourists from all over the nation. Big game in the United States is most abundant in the western areas and in the South and Lake States.

Fishing is probably the leading American outdoor recreational activity. Although fishing occurs over the entire nation in small and large bodies of water, the best fishing is found in the most remote and inaccessible places. This condition will probably prevail for some time in the future, in spite of the vast improvements that have been made in fish-cultural methods.

Summing up the effects of the physical factors of land relief, climate, water resources, and flora and fauna in determining the suitability of land for recreational use, the following conclusions seem warranted: (1) that there is a seasonal shifting in the use of recreational areas, (2) that the centers of population and the recreational areas seldom coincide, (3) that points (1) and (2) indicate the desirability of a national husbanding of recreational resources, since the "migratory" character of these recreational resources makes them the property of the entire nation and not of local groups.[11]

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[10] *Ibid.*, p. 47.

Amount of Land Suitable for Recreation. It is physically possible to use for recreational purposes any land which has such attributes as a varied landscape, unusual formations, proximity to bodies of water, particularly enjoyable climate, and interesting flora and fauna. The extent to which such areas will be used for recreation will depend in large part upon their accessibility for large numbers of people.

The physical factors determining suitability of land for recreation are less sharply restrictive than those determining suitability of land for agriculture and forestry. A wide range in climate might be considered "suitable" for recreational purposes, and what might be considered a "varied" landscape or an "unusual" formation would change a great deal with the cultural advancement of the population, amount of leisure time available, income available for recreation, and related economic and social factors. In other words, the limiting factors are more likely to be economic and social than physical. In the case of agricultural and forest lands the physical factors are more exactly limiting. Consequently, it might be said that the total supply of land suitable for recreation could, under certain economic and social conditions, exceed the amount suitable for either forestry or agriculture. In the last analysis, with the exception of a few barren desert spots, almost the whole surface of the earth and some subsurface areas could be considered as conceivably suitable for recreation of one form or another.

In some parts of the United States, the recreation business provides almost the entire income of the community, and in others it provides a major portion. For example, in Washington County, Rhode Island, the tenth of the land used for recreation pays taxes sufficient to defray two-fifths of the expense of town and local governmental costs for the county. In one town in this county, over 70 per cent of the taxes levied are assessed on recreational real estate.[12]

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[11] *Ibid.*, p. 48.

[12] W. R. Gordon and B. E. Gilbert. "Recreation and the Use of Land in Washington County," Rhode Island Agricultural Experiment Station Bulletin 258.

In Connecticut, the acreage of recreational land amounts to a tenth of the total privately owned land and exceeds that devoted to agriculture.[13] Ordinarily, however, the privately owned land devoted to recreational uses will not make up a large proportion of the total land area of a region.[14]

Some of the more important competitors affecting the supply of attractive recreational areas include water pollution, lumbering, grazing, drainage, and private occupance of strategic points. Large quantities of oil, refuse from industrial mills, sulphurous water from mines, sewage, and other wastes discharged into rivers, lakes, and harbors greatly reduce the attractiveness of these water resources for recreational use, in addition to their harmful effects upon aquatic life. Lumbering, although a necessary land use, does not improve the recreational value of an area. Where overgrazing of an area occurs, erosion is accelerated, reducing the usefulness of the land for wildlife or for any other kind of recreational use. Drainage of swamps and marshes has frequently resulted in serious adverse effects on wildlife. Construction of reservoirs for irrigation and power frequently results in destroying scenic, historic, and archeological values. In extremely arid regions, reservoirs often add recreational value, but too often fluctuating water levels leave unsightly, worthless areas. Individual occupance of recreational areas such as private summer homes, dude ranches, and resorts frequently occupy strategic points which control use of a much larger hinterland.

Recreational use of national resources, therefore, must be correlated with other forms of use, except within areas of primary recreational value. In such primary areas, no competing use should be permitted. Hunting licenses, prevention of stream pollution, preservation of roadside beauty, and similar public activities are essential to continuing recreational use of many areas, because private enterprise, in search of commercial gain, frequently destroys the characteristics of land resources most valuable for recreation.

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[13] N. L. Whetton and V. A. Rapport, "The Recreational Uses of Land in Connecticut," Connecticut Agricultural Experiment Station Bulletin 194, March 1934, pp. 35–36.

[14] In some of the eastern states the proportion may be as large as a tenth, but in more sparsely settled areas it will be nearer to one or two per cent, or less. In a state like Wisconsin, recreational land comprises only three or four per cent of the total privately owned area, even in the northern counties which are used most intensively for recreation. (G. C. Wehrwein and K. H. Parsons, "Recreation as a Land Use," Wisconsin Agricultural Experiment Station Bulletin 422, April, 1932.)

PRESENT USE OF LAND FOR RECREATION

The amount of land used for recreation is difficult to measure, because so much land used incidentally for recreational purposes is concurrently used for something else. Or much idle or waste land, such as mountainous areas, may be used intermittently and incidentally for recreational purposes. Moreover, different kinds of recreation have different space or area requirements. Some idea of the extent of land utilized for recreation can be secured from the acreage in national parks, state parks, municipal recreation areas, game and bird refuges, mountainous areas, national forests, lakes, and areas with hot climates in winter and those with cool temperatures in summer. These acreages, though available for the United States, are not available for the world as a whole. Even in the United States, the amount of land used for recreation can only be roughly estimated, since many mountainous areas have very little recreational value, while some cut-over areas with practically no apparent recreational values may have important significance as hunting areas.

Some of the best-known recreational areas in the world include the Alps in Switzerland, the Land of the Midnight Sun (northern Norway and Sweden), the pyramids of Egypt, the historic cities of the older settled portions of the earth such as Rome, Athens, Jerusalem, etc., and famous resorts like Monte Carlo and Biarritz. Practically every nation has its own particular spots which possess unusual scenic or historic importance.

In the United States, there are some 160 million acres in national forests, and nearly another 10 million acres in national parks, monuments, etc., supervised by the Forest Service and the National Park Service. Nearly 4 million acres throughout the nation are included in state parks, and more than 300,000 acres in municipal recreation areas. On nearly 175 million acres, therefore, recreational use is very important, if not predominant.

More than 211 million acres are used to provide the wildlife essential for hunting and fishing. There are 142 million acres in the national forests open for hunting and fishing, 25 million acres in federal and state game refuges where limited hunting and fishing are allowed, nearly 2 million acres in federal upland game refuges, 35 million acres in local and state upland game refuges, more than a million acres in federal migratory bird refuges, and nearly 7½ million acres in local and state migratory bird refuges.[15]

The above amounts include only publicly owned recreational land. Privately owned lands are also very important in satisfying the demand for recreational services. Privately owned golf courses, summer cottages, athletic fields and playgrounds, summer hotels and boarding establishments, commercial beaches, recreational clubs, summer camps, and privately owned land used for other forms of recreation comprise in the aggregate thousands of acres which pay considerable taxes into public treasuries, federal, state, and local.

It is estimated that some 4 or 5 billion dollars are spent yearly in motor-camping and vacation travel; that about 13 million people participate in hunting and fishing, and that some 200 million dollars' worth of meat and fur is secured yearly from wild animals and birds;[16] that 40 million dollars is spent yearly for the maintenance of more than 150,000 square miles of turf in some 5000 golf courses (most of which are privately owned); and that there are more than a hundred operating dude ranches in the western states (chiefly in Montana and Wyoming) with property valued at several million dollars. Over 3 million people participate in skiing, and in New England alone there are some 1000 miles of ski trails and numerous tows and jumps. Skiing is also done in many western national forest areas, where long, steep ski runs are possible.

When to these are added private land devoted to other recreational uses, including baseball, tennis, football, and related athletic events, it can be seen that the total value of private land used for recreational purposes is very great.

Types of Recreational Areas. The many different types of recreational land include parks, playgrounds, playfields, athletic fields, recreation centers, parkways, primitive areas, wildfire sanctuaries, wildfire refuges, and game preserves.

Parks are areas set aside for recreation, especially characterized by landscape, either natural or designed. They function recreationally as retreats for people for rest, inspiration, and relaxation in an environment of quietness and natural beauty. There are many kinds of parks, ranging from the relatively small neighborhood parks to the extensive national parks like Yellowstone.

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[15] National Resources Planning Board, "Our National Resources: Facts and Problems," 1940, p. 20.

[16] National Resources Board, *Report to the President,* 1934, p. 22.

Playgrounds are areas designated and used principally for the play of children. There are three main types: (1) kindergarten for children below 5 and 6 years of age; (2) small children's playground for children 6 to 10 years of age; and (3) neighborhood playground for use of children up to 15 years old, youth, and adults.

Playfields are designated for sports and games of young people and adults. *Athletic fields* are designed for highly organized competitive games and sports of youth and adults. Attendance at athletic fields is usually subject to a fee.

Recreation centers are areas designed and equipped for a great variety of outdoor and indoor recreational activities for children, youth, and adults. Such centers usually include a children's playground, outdoor games and sports for youth and adults, swimming pool, and a recreation building or community house for social, civic, cultural, and physical activities.

Parkways are landscaped recreational areas comprising as their major features pleasure driveways with bridle paths and hiking trails their entire length. Along such parkways opportunities for such recreation activities as picnicking, hiking, bicycling, boating, canoeing, skating, and riding are frequently available.

Primitive areas are designed to preserve land in its natural state, including its adapted animal and plant life. Many such primitive areas are located within national forest boundaries.

Wildlife sanctuaries are areas set aside and maintained for complete protection of all of their animal life. These are the types of areas set aside for the pleasure of seeing and studying the animal life and are not subject to hunting, trapping, or other similar commercial use. *Wildlife refuges* are areas wherein protection is accorded selected species of animal life and are established for game or non-game animals. The protection may be for aesthetic, scientific investigation, hunting, or commercial purposes. *Game preserves* are areas established and maintained for production of game animals.

Private Recreational Land. Private recreational land may be divided into two major classes—commercial and non-commercial. In the commercial class are included hotels or cottages for rent, commercial beaches, dance halls, private picnic grounds, private summer camps for boys and girls, etc. Non-commercial private recreational land may be made up of recreational clubs (including boating, fishing, hunting, and golf clubs whose property may be used only by the members or their friends), summer homes and cottages not rented for commercial return, large estates on the outskirts or in the better residential areas of cities, and the country estates of wealthy individuals.

Private recreational lands usually possess some scenic value or recreational utility, like riparian land on oceans, lakes, streams, or other bodies of water, or mountainous or hilly forested land overlooking an attractive landscape. In the East and South, sandy beaches suitable for bathing or boating, and well-wooded areas in the hills or mountains, seem to be in greatest demand.

Municipal and County Recreational Areas. Increasing urban concentration makes the major burden of year-round recreational service fall upon city governments. The best possible utilization of recreational facilities within or near the boundaries of cities is highly important. Children's playgrounds and neighborhood parks are most numerous in municipal recreational systems, but the area devoted to these purposes is often inadequate or poorly planned. In too many cities, recreational areas are concentrated in one spot for purposes of economy, and the availability of recreational facilities to many of the smaller children living in sections farthest from the recreational center is thereby reduced. A ratio of one acre of recreational area to every hundred people in the city has been advocated as a minimum standard. On this basis, cities in the United States with 5000 population or more have, on the average, less than half the desirable minimum acreage. Many cities have recently undertaken a comprehensive and well-balanced plan for utilization of recreational lands within their borders. The availability of relief labor during the thirties made it possible to work out development programs to improve recreational facilities, at the same time that unemployed young people made it necessary for cities to furnish more recreational facilities in order to keep crime, vice, and social maladjustments to a minimum.

The county is an important public agency in park planning for the larger metropolitan areas. The total area of county parks in the United States exceeds 100,000 acres.[17] In some of the western states, counties make practically no expenditures for recreational services, leaving this service to municipal, state, and federal governments. However, in the East or Middle West, where a large city may take up most of the county's area, counties have been more active in developing parks, playgrounds, camps, and related recreational facilities. It has been suggested that an area equal to that occupied by urban developments should be accessible for public recreational activities within a hundred miles of each large city.

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[17] National Resources Board, *Report to the President,* 1934, p. 146.

State Recreational Areas. State governments spend much less for recreational services, in proportion to their total budgets, than do county or city governments.[18] The recreational services which state governments have rendered have been largely those of developing state park areas and state game and migratory bird refuges. The total area in state parks is nearly 4 million acres. Forty-four of the 48 states have state parks or areas set aside primarily or wholly for recreational use and 46 have state game refuges covering 44 million acres.

Federal Recreational Areas. Several divisions of the federal government provide and operate recreational facilities which, in the aggregate, are of great national importance. The most important of these are the National Park Service (which administers the national parks, national monuments, national cemeteries, battlefield sites, and miscellaneous national memorials comprising some 22 million acres), the National Forest Service (which administers the national forests and primitive areas used for recreational purposes),[19] and the U. S. Bureau of Biological Survey (which administers wildlife refuges, comprising some 14 million acres, and supervises many activities designed to conserve wildlife in the United States).[20] In addition, the U. S. Bureau of Fisheries propagates and distributes food and game fishes; the Civilian Conservation Corps, as an agency to employ young men during the thirties, did much to develop land resources for increased recreational use, particularly in national and state parks, and national and state forests; and rural recreational activities are encouraged by the Agricultural Extension

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[18] State governments in 1941 spent only three-tenths of one per cent of their total cost payments for recreational services, compared with the expenditure of 3 per cent of all local government. (See U. S. Department of Commerce, *Statistical Abstract of the United States, 1943,* Bureau of the Census, Washington, D. C., 1944, p. 289.)

[19] The national forests are visited annually by several million people to camp, picnic, swim, fish, hunt, or ride in summer and fall, to ski, skate, or snowshoe in winter, and by additional millions of sightseers who are interested in scenery and climatic relief.

[20] These activities include grants-in-aid and cooperation with the states in wildlife restoration projects through the Pittman-Robertson Act.

Service, through its 4–H Clubs and rural recreation specialists and by the Agricultural Education Service of the Office of Education, by means of the Future Farmers of America.

PECULIARITIES OF LAND IN RECREATIONAL USE

The major characteristics peculiar to recreational land are (1) *that use of land for recreation is, in many cases, only partial and often a non-competing use;* (2) *lands which would be waste lands and strictly submarginal for any other major use are often very useful for recreation;* and (3) *the benefits of many types of recreational lands are difficult to measure and consequently hard to operate on a private business basis in competition with other major uses.*

A Partial and Often Non-Competing Land Use. Many examples could be cited to demonstrate that recreational use is often a partial and non-competing land use. Utilization of forest lands is an excellent example. In the national forests, the construction of trails for hiking, establishment and maintenance of picnic grounds, and hunting are all examples of the partial use of forest lands for recreation. Each of these uses can be considered non-competitive with the forest since they do not appreciably reduce timber yields or the value of the forest. As a matter of fact, good trails frequently facilitate getting into and out of a forest for inspection trips and fire control activities.

The use of water resources for recreation usually constitutes partial and non-competing use of this resource. For example, the lakes and bodies of water created by reservoirs and dams for power and irrigation provide fine recreational resources in the form of fishing, boating and canoeing, swimming, and skating. These recreational uses do not reduce the value of the resource for its primary uses—hydroelectric power and irrigation water for crop production.

Agricultural land resources are frequently used partially for recreation without reducing the value of the lands for agricultural production. For example, on the east shore of Flathead Lake in northwestern Montana the lands bordering the lake are used largely for sweet cherry orchards. The area is a beautiful scenic and recreational area, in the heart of the Rockies with Glacier National Park nearby. Many tourists and summer vacationists use the area for recreation—fishing, boating, swimming, and restful relaxation. A cherry producer with several cottages on his property to house cherry pickers during the brief picking season, can rent them to vacationists for recreational purposes the rest of the summer. These vacationists provide an important market for locally grown produce such as cream, milk, eggs, broilers, fryers, and small fruits; excellent prices are usually obtained. Thus, the recreational land uses, rather than being competing uses, call forth and make profitable complementary agricultural land uses.

Waste and Submarginal Lands Often Useful for Recreation. Lands unsuited to agriculture and forestry because of physical conditions may be very useful for recreation. For example, the badlands of South Dakota with their bare, rough terrain are practically valueless for farming or forestry and have very little value for grazing. The same physical conditions that make them of so little value for these purposes make them valuable for recreational uses. Much the same can be said for the Painted Desert country in the Southwest. High mountain tops, deep colorful canyons like the Grand Canyon of the Colorado and the Yellowstone, and similar lands are unproductive for farming, grazing, or forestry, but are excellent for recreational purposes.

Recreation, therefore, makes effective use of many areas that would otherwise make little or no contribution to the general welfare. In this way, the benefits from our total land resources are maximized.

Benefits Difficult to Measure for Private Operation in Competition with Other Uses. Many of the benefits to individuals and the public generally from wise use of land for recreation are difficult to measure in dollars and cents. For example, provision for adequate recreational facilities and qualified leadership serves to cut down the cost of police, prisons, and courts. There are also savings in hospital bills and maintenance of insane asylums, because of the better physical and mental health resulting from adequate recreation.

The impossibility of measuring these benefits accurately, combined with the prevailing American notion that outdoor recreational facilities such as campgrounds, picnic spots, hunting, fishing, hiking, etc., should be free, makes it extremely difficult to operate such recreational facilities satisfactorily through private ownership on a cost charge basis. Where exclusive occupancy and special services are involved, special charges can be made as an equitable means of sustaining private ownership costs. For example, the modern campground, in point of facilities offered, is just one step below the tourist cabin. It ordinarily provides safe water supply, safe sanitary facilities, and often shower baths; a place to cook meals, a table and benches; very often daylight shelter in case of bad weather; and police protection.[21]

Similarly where exclusive occupancy or use is given for hunting and fishing privileges, specific charges can be levied to meet private ownership costs. This is occasionally done. However, such general recreational uses as hiking, viewing scenery, and in general enjoying outdoor beauty, or other recreational land uses which do not involve exclusive occupancy or special service can best be handled through public ownership. This is especially true when the use of land for recreation is only a partial one with a major use for some other purpose, or when the land used for recreational purposes is waste land or land submarginal for all other major uses.

Economic Effects of Developed Recreational Resources. Establishment of parks of the municipal or metropolitan type has important and beneficial results on the value of properties adjacent to or near them, particularly when these properties are devoted to residential uses. There is a genuine money value in an attractive outlook from a dwelling place and in the ready availability of breathing spaces for rest or physical activity. Purchasers or renters of residence property recognize these money values.

An important achievement resulting from establishment of recreational parks is the increased emphasis placed upon logical planning and development of lands surrounding them. This is particularly true in townships surrounding county park lands.[22] Because of the parks, lands have taken on new values as residential sites, and the towns, appreciating the fact that this growth must be guided, have created zoning boards.

The increased desirability of adjoining lands for residential use is similar in the case of state parks and city parks to that of metropolitan and municipal parks, although this residential use is largely of the summer home type. Most of the effects on values are due to commercial opportunities which result from the use of the parks. The tendency of parasite commercial ventures to establish themselves as close to the park entrance as possible depreciates the value of the park by crowding in on it with architecturally ugly and heterogeneous structures. Examples are the gasoline station, the "hot dog stand," the dance hall, etc. Such economic developments may be controlled by establishing areas of concentrated use well inside the park or by providing parking approaches on which complete public control of the roadside exists; by zoning; or by acquiring easements limiting use of lands within a certain distance of the park entrance.

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[21] National Resources Board, "Recreational Use of Land," p. 59.

[22] *Ibid.*, p. 60.

The part which recreation plays in preventing juveniles from becoming criminals and in helping to reform them is generally recognized by sociologists. Funds invested in playgrounds and recreational lands are far more productive of beneficial results to society than those spent in building a prison or reformatory. Studies of the effects of playgrounds and community centers on the extent of juvenile delinquency show that the existence of active play areas reduces the amount of juvenile delinquency in the neighborhood.

FUTURE RECREATIONAL LAND REQUIREMENTS AND RESOURCES

Increased demand for recreation is characteristic of a culturally progressive people. Recreation furnished through private enterprise is inadequate to meet these increased demands, principally because (1) risk is too great and profit prospects too small in many recreation ventures, and (2) many recreational opportunities provided by private enterprise are beyond the financial means of people who may need them most. Public agencies have therefore taken the responsibility for developing recreational facilities—directly, as recreational land use enterprises, or indirectly, in connection with their other activities, providing increasingly important recreational services, without charge, to many groups who need and enjoy these services most. Greatest expansion along these lines has occurred in parks and playgrounds created within city boundaries, and national and state parks, forest reserves, game refuges, primitive areas, and similar recreational lands. There has also been a considerable increase in privately owned land devoted to recreation, of which the growth of dude ranches in the western states is a good example.

Land Needed for Recreational Use. In spite of these developments, it is generally conceded that recreational facilities have not kept pace with the demand created by expansion of leisure and modern thinking in regard to desirable recreational standards. Undoubtedly, as shorter working days and increased leisure are made available through the advance of science and technology, the amount of recreational land will increase considerably. Improvements in transportation methods, particularly improvement of the automobile and airplane, will make it possible to bring into use or use more intensively areas now only partially or slightly used for recreational purposes.

The prospective increase in recreational land use is reflected in estimates showing acreages which in 1960 will be, or should be, utilized for recreational purposes. These estimates are: national parks and monuments, 32 million acres (more than three times the current area); state, county, and municipal parks, 10 million acres (nearly triple the present amount); bird and game refuges, 38 million additional acres more than present acreages.[23]

The peculiarities of land in recreational use, analyzed in the preceding section, give rise to the major problems associated with recreational land development and utilization. The following problems are of particular significance in the case of recreational lands: (1) the close interdependence and needed integration of recreational and other important land uses; (2) division of responsibility and control between public and private owners; and (3) division of responsibility and control among local, state, and federal public agencies.

A Program of Development to Meet Recreational Needs. Areas primarily of recreational value should be designated and conserved unimpaired as such, and should not be encroached upon by other commercial uses. Because recreational use of land often must be concomitant with other uses, provision for recreation must be included in an over-all national plan of land development and conservation. Accordingly, the National Resources Board in the early thirties drew up a plan for development and conservation of recreational resources in the United States based upon coordination of existing agencies of government and division of responsibility among local, state, and federal public agencies. This plan advances the following program to meet the needs of recreational lands for the American people in the years ahead:[24] (1) Supplying facilities for the day-by-day recreational needs of the people is primarily a local responsibility. The focal point and foundation of a national recreation plan are within the municipalities and their immediate environs. Essential recreational requirements of any municipality include adequate and properly distributed play areas for children and adults, "intown" small landscape parks, and a few large parks. In municipalities of 10,000 inhabitants or over, one acre of recreation area to each 100 persons is a satisfactory minimum, divided as follows: children's playgrounds, 12 per cent, composed of units 3 to 8 acres in extent; neighborhood playfields, 15 to 18 per cent; miscellaneous recreation areas, an undetermined percentage, depending on the kinds of recreation to be provided; the total of these three types amounting to 30 to 50 per cent of the whole. The balance would be composed of equitably distributed neighborhood or "intown" parks and large areas characterized by landscape or natural features. To provide communities of less than 10,000 people with the essential components of a city park and playground system, the ratio of recreational area to population should be about as follows: 5,000 to 10,000 people, one acre to each 75 inhabitants; 2,500 to 5,000 people, one acre to 60; 1,000 to 2,500 people, one acre to 50; and communities under 1,000 people, one acre to each 40 residents.

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[23] National Resources Planning Board, *Report to the President*, p. 109. The authors of "What About the Year 2000?" estimate a probable ultimate need of between 5 and 10 million acres for state parks alone. (Joint Committee on Bases of Sound Land Policy, *What About the Year 2000?*, Federated Societies on Planning and Parks, Washington, D. C., 1929.)

On the basis of the above standards, the minimum recreational area for cities of 10,000 or more inhabitants would total nearly 600,000 acres for the nation as a whole, and for towns and cities with less than 10,000 people, the minimum recreational acres would total more than 362,000. Thus, nearly a million acres, or about 10 per cent of the total area of all lands devoted to municipal uses in the United States would be devoted to municipal recreation.

(2) Provision of parks and playgrounds for the population of metropolitan regions comes next in importance in the national recreational scheme. Planning in this sphere should include recreational service for residents of smaller "satellite" cities as well as for those of the principal cities, and for those of rural farm and rural non-farm areas. Two major zones of development are involved: the area of fairly heavy population surrounding the central city, when the types of recreation area to be provided are analogous to those

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[24] "Recreational Use of Land," pp. 17–29.

within the municipality; and the more sparsely populated area within approximately 2 hours of automobile travel of the central city. A number of cities have gone well beyond their borders in acquiring parks. Counties, special metropolitan park districts, and states may all act as agencies for provision of metropolitan parks. Regardless of the agency or agencies involved, however, planning should be on a unified basis for the entire metropolitan region, usually extending for some 40 to 60 miles from the heart of the central city.

(3) Every state has areas either of such high scenic value or of such high value for active recreation, or both, or possessing such interest from the scientific, archeological, or historical standpoint, that their use tends to be state-wide in character. Requisition of such areas and their development and operation are primarily a function of the state, but this should not preclude joint participation by the state and such community or communities as might receive a high proportion of the resulting benefits.

(4) Taking the nation as a whole, there are areas of such superlative quality, because of their primeval character or scenic excellence, or historical, archeological, or scientific importance, or because of some combination of these factors, that they are objects of national significance. It is the responsibility of the federal government to acquire and administer these.

Federal responsibility is emphasized especially in the case of primeval wildernesses. Remaining areas of primeval condition are few. A wilderness reserve ordinarily should be large—at least one quarter million acres, and even 2 million acres may be too small if its boundaries are not properly located, for example, Yellowstone Park, which contains little natural range for its elk, deer, antelope, and bighorn. It is obvious that the task of saving the primeval must be largely a federal responsibility.

Other fields for federal responsibility are the ocean and Great Lakes beaches. These are extensively sought by people living great distances from them. They are unlikely to be acquired by the states to a sufficient extent, and the federal government should acquire and administer a representative group of them.

It should be evident from the above that a national recreation plan which will be adequate to meet the needs of the nation must have local, state, and federal components.

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CHAPTER TEN

MINERAL RESOURCES

THE types of land utilization previously discussed—agriculture, forestry, and recreation—are genetic or reproductive in character. Mining, however, is an extractive industry. Minerals are formed so slowly that for all practical purposes they are not replaceable. Within the mineral industry itself, however, there are marked differences in the amount and degree of destruction which comes from use. The fuels like coal and oil, once burned, are gone. In contrast most of the metals are only partly destroyed by use and a high percentage of the scrap is recoverable. Eventually, the stock of scrap may be so large as to affect appreciably the annual demand for new metal. The non-metals are between the fuels and metals as to recoverability. The chemicals, like nitrates, once used are so changed in form that recovery is often unprofitable. On the other hand, most building stones can be used over and over again almost indefinitely.

NEED AND DEMAND FOR MINERAL LANDS

The problem of furnishing and maintaining an adequate supply of minerals is recent. Until the Industrial and Mechanical Revolutions created a demand for fuels to operate the new machinery, coal was used only in small quantities for household use. The development of mechanical equipment made it possible to mine coal more rapidly and deeply, and thus increase coal production for expanded industrial use. The accelerating rate of advance of technology in recent decades has made a heavy drain on mineral resources generally. As a result, the world has produced more minerals since 1900 than in all previous time.

Importance of Minerals in the Economy. The most striking characteristic of modern civilization is its widespread use of power machinery, which depends for its source of energy upon the mineral fuels. More than four-fifths of the energy used in the United States is derived from the fossil fuels (coal, oil, and natural gas). The actual human energy involved in mining, refining, and transporting these fossil fuels is only about 3 per cent of the energy realized from them. Consequently, they are an unusually efficient energy source.

Minerals are extremely vital in modern economies, since they furnish the metals for all the mechanical contrivances in daily use, and the fuel to operate most of them. They also furnish the metals and energy for armaments. The importance of coal and iron in making the steel used in modern armaments, and of the petroleum used as fuel, creates an intense public interest in these products. If modern nations are to enjoy a rising level of living with the wealth of mechanical contrivances and energy sources such a level demands; the supply of minerals, particularly the fuels and metals, must be assured for the future, or new techniques or substitutes developed. Certainly a national policy of conservation and wise use of such basic minerals, with special kinds of public regulation or operation to assure adequate supplies, is justified.

In the United States, about two per cent of the gainfully employed are engaged in mining, and the mineral lands of the nation are estimated to be worth between 3 and 4 billion dollars.

Competition of Mining with Other Land Uses. Much mining is done underground so that the surface, in many cases, can be used for other purposes. In some instances, only the subsurface rights are purchased, to permit extraction of the underground mineral deposits, while surface and supersurface uses continue unmolested. For example, the city of Butte, Montana, is built directly over many of the mining shafts, some of which go down to ore bodies a mile below the surface, so that the land serves a double use—for urban residences and also for mining. In other cases, however, serious conflicts may arise between mining and the surface and supersurface uses of land. For example in the strip mining of coal or open copper mining, the land is made useless for any concurrent use. The fact that mining lands ordinarily require very little surface area minimizes the competition of this use with other land uses.

Physical factors determining the economic supply of land for mining vary with different minerals. For example, ore bodies containing a given percentage of gold or silver might be profitably mined, while the same percentage of copper or zinc in another ore body might be considered very low grade. Location of ores relative to consuming centers is an important factor in the profitableness of many mines, but comparatively insignificant in others. For example, the contiguity of iron ore and coal deposits is very important in determining profitableness of exploitation, while the location of diamond deposits relative to any other metal, or to consuming centers, is relatively unimportant. The quality of the mineral is an important physical factor determining profitableness of utilization, and the type of material found in combination with the mineral in the ore deposit is also a very important physical factor limiting the amount of land used for mining at any given time.[1] Such physical factors as climate, soil characteristics, topography, and the like, which are so important in determining the suitability of land for agriculture, forestry, or recreation are of minor or no influence in determining lands that will be utilized for mineral production.

ADEQUACY AND DISTRIBUTION OF MAJOR MINERALS

The physical supply of the various minerals which may exist in the earth is unknown. In some cases, figures representing the physical supply of certain minerals are given in terms of proven reserves, in which case ore bodies have been rather carefully studied and geologic formations analyzed so that the estimates are quite accurate. In others, available figures are at best only approximations, estimates, or intelligent guesses. However, the United States is one of the most fortunate nations of the world, from the standpoint of deposits of the major strategic minerals. In spite of certain deficiencies, the United States approaches self-sufficiency in its domestic mineral supply more closely than any other nation.

The United States is noticeably weak in tin and nickel, producing only small amounts of these annually. Other minerals in which the United States is wholly or partly deficient include antimony, asbestos, barite, bauxite, chromite, fluorspar, graphite, magnesite, manganese, mercury, nitrates, pyrites, quartz crystal, talc, and tungsten.[2]

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[1] If the amount of overlying material is small, mining by stripping may be possible; if the deposit is buried more deeply, a shaft must be sunk to or into the deposit, making additional expense. If the beds are very thick, as is frequently the case in coal deposits, it may be difficult to get adequate support for the roofs of necessary horizontal openings or drifts into the deposits. (For a discussion of the effects of position and physical condition of the deposits on mining, see D. H. Davis, *The Earth and Man*, Macmillan., 1942, p. 479.)

[2] National Resources Board, *Report to the President*, p. 444; and "The Strategic and Critical Minerals," Army and Navy Munitions Board, Washington, D. C., mimeographed, March 1940.

Substitutes can be developed for many uses of most of these minerals, and the United States has adequate reserves of some, like barite; but their location relative to consumption centers is disadvantageous, or their grades are unsuited for certain uses. In the case of nitrates, domestic requirements can be met by synthetic production.

Minerals may be divided into three groups: mineral fuel, metallic, and non-metallic resources. The adequacy of the known supply varies greatly among the various minerals. For some, such as coal, reserves are adequate for centuries ahead; for others, like petroleum, known resources are very small; and for still others, such as tin, the supply of new metal is an immediate problem. The greatest variety and most adequate reserves are found in the nations bordering on the North Atlantic—the United States, Canada, and northwestern Europe. With the exception of tin, the United States and Canada have a large supply of the important industrial minerals. Northwestern Europe has a wide variety of metals and coal, and lacks only petroleum in large quantities. Asia and eastern Europe have metals and fuels in adequate amounts, but the deposits are frequently distributed so unevenly and distances between them are so great that their significance is reduced. Excluding Australia, the continents of the Southern Hemisphere have inadequate supplies of coal. In South America, petroleum tends to make up for this deficit, but Africa has practically no oil. Both South America and Africa are rich in metals.

Mineral Fuel Resources. Of the mineral fuels, the three fossil fuels—coal, oil, and natural gas—furnish more than 85 per cent of the energy used to operate the modern machine economy of the United States. Coal accounts for more than three-fourths of the total world tonnage of all minerals produced, world production amounting to more than a billion and a half metric tons annually, most of which is produced in the two continents of Europe and North America.

Coal is one of the three basic minerals. Iron is the most important of the metals, being commonly referred to as "the harnesser and magnetizer"; coal as "the reducer and energizer," and the third great mineral—copper—"the conductor of electrical energy." Coal mining reaches its fullest development only where iron is found, because both are basic in the production of steel for modern machinery. Few areas are favored by possession of both coal and iron ores in

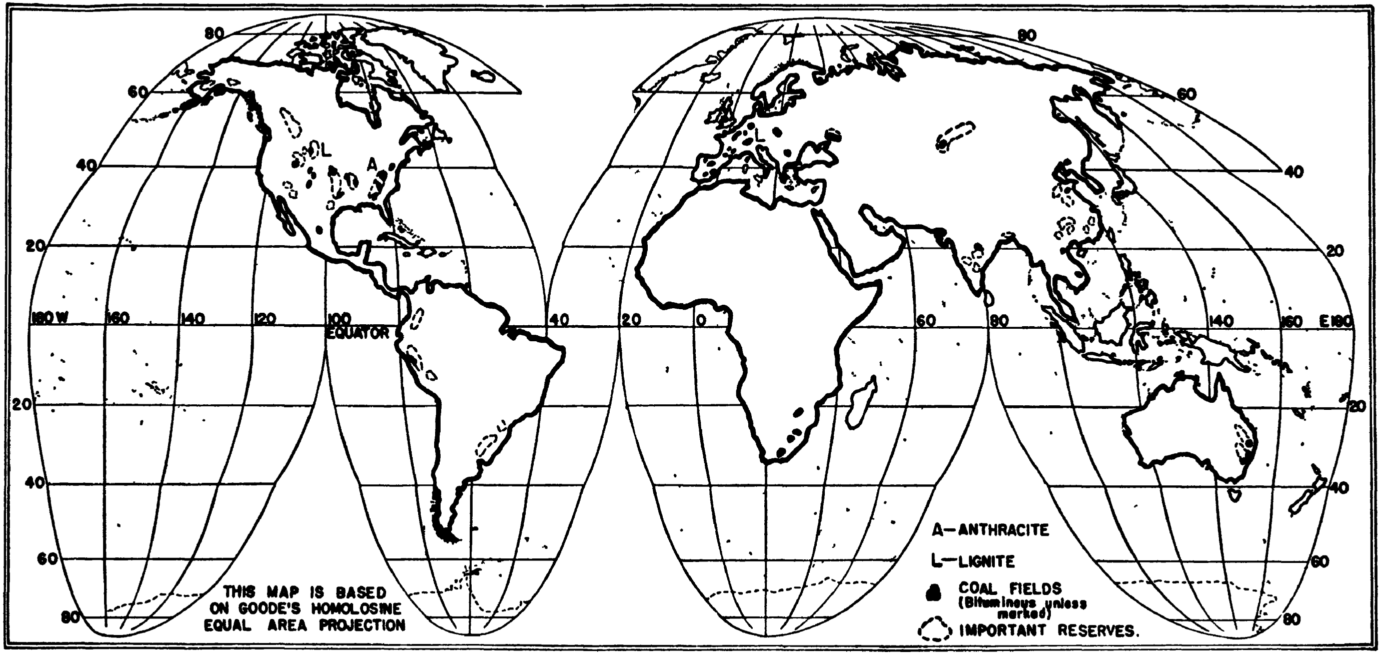

FIGURE 30. Coal Resources of the World. (Adapted from L. E. Klimm, O. P. Starkey and N. F. Hall, *Introductory Economic Geography*, Harcourt, Brace, 1937; and D. H. Davis, *The Earth and Man*, Macmillan, 1932.)

satisfactory quantity, quality, and location. Only in areas bordering the North Atlantic are both coal of satisfactory quality and high-grade iron ores present. The geographic distribution of the two minerals has been of fundamental importance in the concentration of industrial development and dominance in world affairs of the countries of the great oceanic basin of the North Atlantic.

There are more than 7 trillion tons of coal deposits within 6000 feet of the surface of the earth, or enough to last some 6000 years at the present rate of consumption.[3] The distribution of these deposits among the nations is very uneven, however (see Figure 30). The continent of North America contains over two-thirds of these entire reserves, and the United States has slightly more than half. the world's total. Asia ranks second with about 17 per cent of the world's reserves, but many of these are far from markets, and transportation facilities are frequently lacking. Europe ranks third in importance, but has considerable reserves in proportion to its area, and has the added advantage of having most of its reserves close to markets.

The highly industrialized countries of North America and Europe contain only three-fifths of the world's coal reserves, but produce more than four-fifths of the world's annual average output. Every nation that produces more than 50 million tons annually is located in North America and Europe. These nations, particularly the United States, Great Britain, Germany, and France, are industrially and commercially active, and have very well-developed transportation facilities and highly mechanized industries. Oceania has abundant reserves in proportion to its population, and ranks fourth among the continents. Africa and South America are very poorly supplied with coal.

The United States has proved reserves of 15 billion tons of anthracite coal and 2½ trillion tons of bituminous coal reserves. The anthracite fields in the eastern part of the United States, primarily in Pennsylvania and West Virginia, are high in quality and are close to the northeast industrial area and the lake states. The coal deposits in the central United States are bituminous, and those between the Mississippi River and the Rockies, although high in quantity, are low in quality.

Petroleum accounts for approximately a third of the total energy

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[3] L. E. Klimm, O. P. Starkey, and N. F. Hall, *Introductory Economic Geography*, Harcourt, Brace, 1937, p. 246.

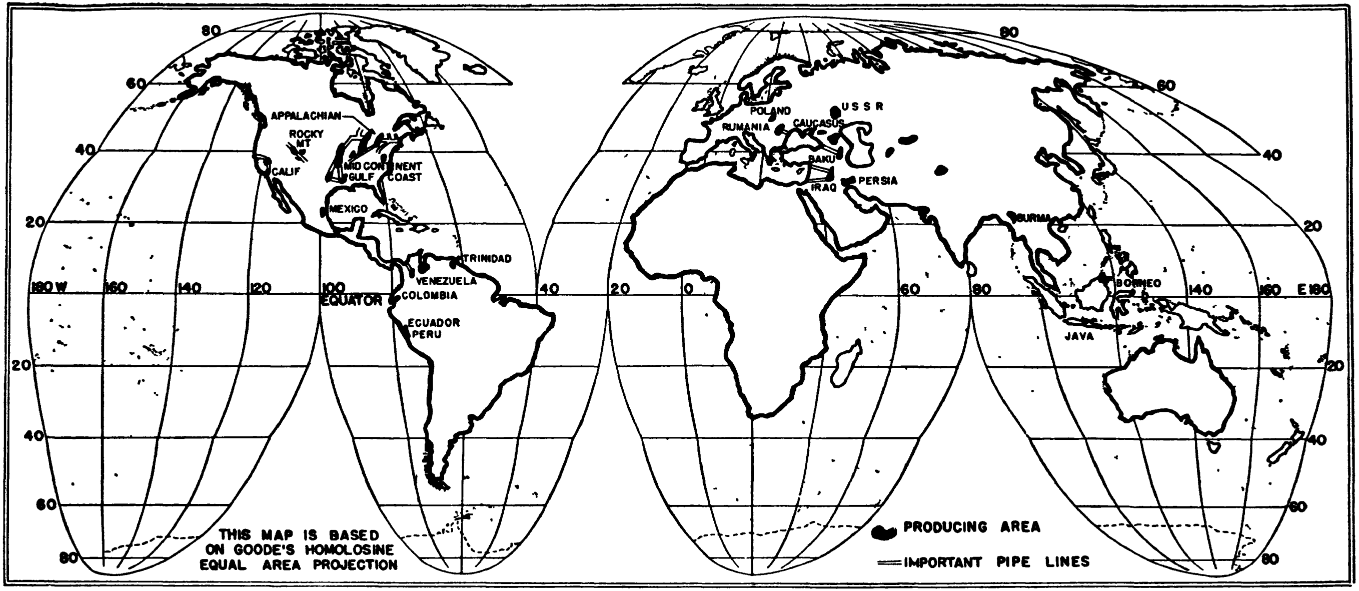

FIGURE 31. Petroleum Fields of the World. (Adapted from L. E. Klimm, O. P. Starkey and N. F. Hall, *Introductory Economic Geography*. Harcourt, Brace, 1937.)

supply in the United States, and a 12 billion dollar industry has developed around the production, refining, and marketing of U. S. oil and its products. The United States, having produced and consumed about two-thirds of the total world production during the last seventy-five years, uses more oil than all the other countries of the world combined. This heavy consumption has been out of proportion to proved reserves in the United States and fears of an imminent shortage have arisen repeatedly. Discoveries of new oil fields, however, have always occurred in time to allay these fears, and in recent years, overproduction rather than inadequate supply has been a serious problem.

Although crude petroleum is found in every continent, the major oil fields are restricted largely to North America, northeastern South America, southeastern Europe, southwestern Asia, and the East Indies (see Figure 31). Petroleum has a relatively high value in proportion to its weight and bulk, and can be profitably transported large distances from its source to the markets where it is to be used. On the other hand, coal and water power are ordinarily used near their source. Only two important industrial nations, namely the United States and the U. S. S. R., have an adequate petroleum supply within their boundaries. Thus, petroleum plays a much larger part in world trade than other minerals like coal, frequently traveling thousands of miles to reach its market.

The United States is the world's largest producer of petroleum, as well as the largest consumer. The United States has produced about two-thirds of the world's oil to date, and currently produces about three-fifths of the annual output. The U. S. S. R. and Venezuela rank next in order, with between 10 per cent and 12 per cent each. Rumania is an important producer, as are also Iran (Persia) and Iraq (Mesopotamia), the Netherlands Indies, and Mexico, each of these producing from 3 to 5 per cent of the world's total production, annually.

In spite of the fact that the United States has produced and is producing more oil than all the other nations combined, her boundaries contain only about one-sixth of the earth's rock formations favorable for the presence of oil. Fields in the Middle East have produced less than 4 per cent of the output to date, but have about 30 per cent of the probable ultimate world reserves of some 600 billion barrels, or 180 billion barrels. About a fifth of the probable ultimate world reserves are in Russia, an eighth in the Caribbean

Basin, a tenth in the Southwest Pacific, and the remaining tenth in the rest of the world.

It is estimated that only a tenth of the probable ultimate world reserves of 600 billion barrels can be removed from explored fields by present methods for sale at present prices. In the case of the United States, there are between one and one and a half million square miles in the United States and about six million square miles over the earth as a whole, which, from a geological standpoint, favor the presence of oil. On the basis of past experience, about one per cent of this area, or about 15,000 square miles in the United States, contains oil in commercial quantities. All the oil fields developed in the nation to date total only 8000 square miles. On this basis it would seem that areas at least as large as present fields remain to be developed.[4]

The third ranking mineral fuel is natural gas. The United States possesses greater natural gas reserves than any other country, and uses about 2¼ to 2½ trillion cubic feet annually. Much natural gas is wasted in connection with oil production and other inefficient utilization methods. It should always be kept in mind that the mineral fuels—coal, oil, and gas—disappear forever when they are removed from the ground and used.

Metallic Resources. Of the metals, iron is by far the most important. Approximately four-fifths of the iron ore mined in the United States comes from the high-grade hematite deposits of the Lake Superior region, which contain a larger iron content than the average for the rest of the nation. Of the iron ore reserves likely to be available in the future, some 70 billion tons are in the Lake Superior region, whereas in all the remainder of the United States, not much more than 5 billion tons of low-grade ore are known. Thus, it would seem obvious that the great center of iron ore exploitation in the United States for some time to come will be in the Lake Superior region, whether we consider the ores available at the present time or those which may be available in the future.[5]

Canada also has comparatively large iron ore reserves in the rich Lake Superior region. Some 26 nations mine iron ore, but only 6

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[4] Eugene, Holman, "Oil—Product and Pillar of Freedom," (Address to New York State Chamber of Commerce, April 6, 1944), Standard Oil Co., New York, 1944. See also L. M. Fanning, (ed.), *Our Oil Resources*, McGraw-Hill, 1945, p. 117.

[5] C. R., Van Hise, and L. H. Havemeyer, *Conservation of our Natural Resources*, Macmillan, p. 61.

(the United States, Germany, France, Great Britain, Belgium, and Russia) produce large quantities of pig iron. These six, together with Spain and Sweden, are the only large producers of iron ore. This relative concentration of production is associated with the availability of fuel resources because, in order to produce a half ton of iron, over a ton of coal is necessary to furnish power for mining and transporting the iron ore, and for reducing the ore to the metallic iron.

The deposits of useful grades of iron ore are much more widely distributed than existing producing areas. Limitations of fuel resources in the form of coal, and of a ready market in industry, limit the producing areas to those indicated. Leith indicates four basic conditions which must be met before a modern steel industry or a large market for iron can be developed: (1) There must be a huge ore reserve of suitable grade in a limited area; (2) a large coal supply of good grade for use in smelting must be accessible; (3) a population large enough and with sufficient industrial development to furnish a strong demand must be accessible; and (4) people with organizing ability, driving power, technical skill, and the capital essential to convert the iron ore into forms adapted to demand must be in control of the industry.[6]

The major iron ore bodies which meet the conditions essential to make them commercially important today are found in the Lake Superior and southern Appalachian regions in the United States; the Lake Superior region in Canada and in Newfoundland; Cuba; central Chile in South America; Sweden; Great Britain; the U. S. S. R.; Germany; France; and Spain. Less important deposits occur in North China and the Yangtze Valley, and in Malaysia. There are other deposits, some of large amounts of high-grade ores, that are of potential future importance, particularly those of eastern Brazil and northeastern India. These deposits are shown in Figure 32.

The iron ore reserves of the United States are both large and well located. Discontinuous beds of hematite occur in the Appalachians from New York to Alabama. These are mostly low-grade ores, but their association with coal and limestone has resulted in extensive development in the Birmingham, Alabama, area. There are also deposits of possible future significance in the western states. The most important deposits, however, are those of the Lake Superior region

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[6] C. K. Leith, "The World Iron and Steel Situation, in Its Bearing on French Occupation of the Ruhr," *Foreign Affairs,* June 1923.

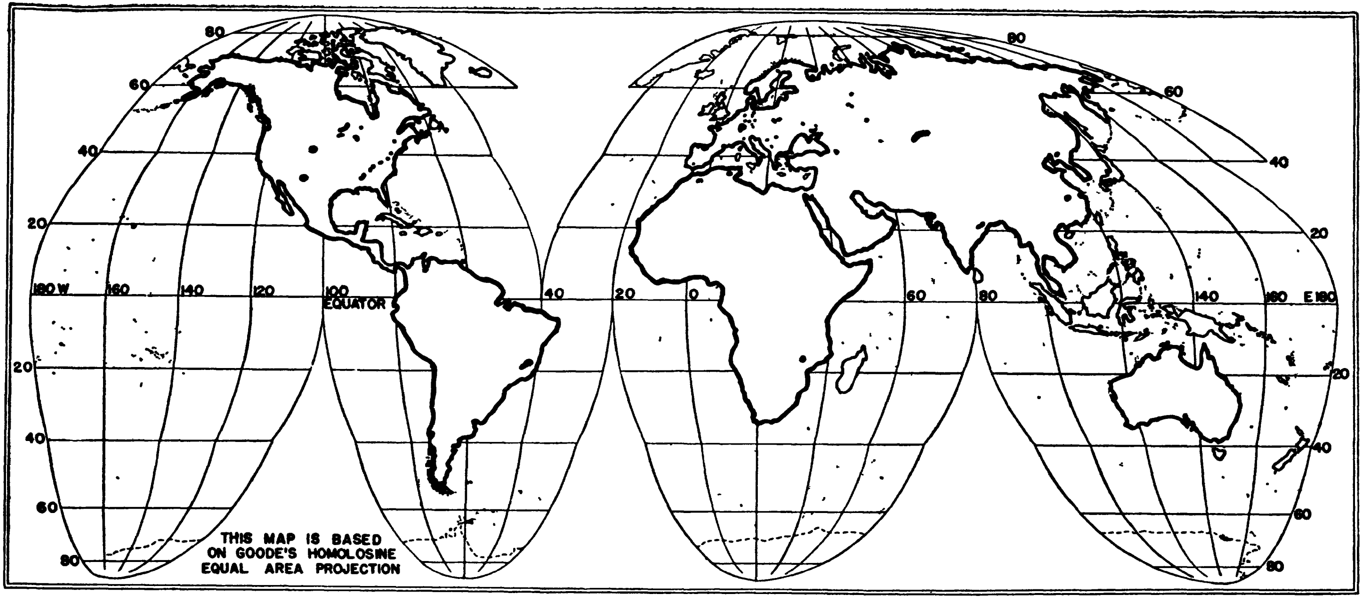

FIGURE 32. Principal Iron Ore Deposits of the World. (Adapted from D. H. Davis, *The Earth and Man*, Macmillan, 1932.)

in the upper peninsula of Michigan, northern Wisconsin, and the Mesabi Range in northeastern Minnesota. These Lake Superior ores are not only high grade, but occur so near the surface that they can be worked by steam shovel, or where strip or open-pit mining is impossible, shafts do not have to be sunk to very great depths.

The world's reserves of iron ore have been estimated at as little as 92 billion tons to as high as 243 billion tons. Some 66 billion tons have been classed as commercially exploitable. World production of iron ore averages around 150 million tons yearly. The probable duration of iron ore reserves depends on the rate of consumption in the future, and on technological developments. At present utilization rates, the Lake Superior fields in the United States are estimated to last only 45 years, while the Newfoundland field would last some 4000 years.

Ferro-Alloys. The ferro-alloys, including nickel, silicon, manganese, molybdenum, chromium, tungsten, and vanadium, are important in modern industry. It is significant that no modern industrial nation is an important producer of any great number of these, while some of the leading steel-producing nations produce none of them. For example, Canada produces most of the world's nickel; manganese is found principally in India, the Caucasus area in Russia, Brazil, West Africa, and the United States. Chromium is produced principally in Rhodesia, the United States, and India; vanadium in Peru, western United States, and Africa; tungsten in China, Burma, Japan, Australia, Bolivia, and the United States. Silicon is the most widely distributed and abundant of the ferro-alloys and always occurs in combination with other elements. Some nations have deposits of one or more of these important alloys, but the quality of the ore bodies may be so low that economic production is not feasible. For example, the United States has large deposits of manganese and chromite, but has depended in the past largely upon imports, because her deposits are geographically located at great distances from the industrial centers, or are too low in metallic content to be worked efficiently under ordinary circumstances.

Manganese is frequently classified separately from the ferro-alloys, because even though it is used as an alloy with steel, it is used in the making of almost all steel and is thus different from most of the others, which are used only when some additional quality is to be added to the steel for a special use.[7]

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[7] For a more complete statement regarding the principal ferro-alloys and their uses see Klimm, Starkey, and Hall, *op. cit.*, p. 255.

As in the case of iron, alloys can be re-used. It is true that it is comparatively difficult to separate the alloy from the steel scrap, but it is becoming increasingly common to re-use alloy steel scrap in making new steel of the same specifications.

Non-Ferrous Metals. Copper is the most important non-ferrous metal in modern industry. Workable copper deposits are much more widespread than valuable iron ore deposits, yet economic and social difficulties accompanying copper mining are much more pronounced. Leading producing states in the United States are Arizona, Utah, Montana, Nevada, Michigan, and New Mexico. Utilization of scrap copper or old copper reworked is equal to about half the new metal produced annually. The United States has some of the lowest cost mines in the world, but has already exhausted a considerable portion of her original deposits of copper ore; and centers of world production are shifting to Chile, Canada, and Africa, whose combined reserves now exceed those of the United States by four to one.[8]

Copper ranks next to iron as the most useful metal in modern machine civilization. Technological developments in recent years have made it possible to refine cheap grade ores which a few years ago were considered valueless. Since there are relatively large reserves of comparatively cheap grade ores located in various parts of the earth, the supply of copper is considered quite adequate for future needs.

The United States produces some 40 per cent of the world's production of lead, and the North American continent produces about 50 per cent of the world's total. Lead is produced in some twenty countries. but eight of them together produce more than 90 per cent of the total. Canada and Mexico, besides the United States, are important producers, and in Europe the principal production comes from Silesia (where the borders of Germany, Poland, and Czechoslovakia overlap). The Spanish mines in the Sierra Morena have been worked for many centuries, and production costs are now high. Australia also is an important producer, and Burma accounts for most of the output from Asia. In the United States, considerable amounts of old lead are recovered for reworking, and although the proportion is less than that in the case of copper, it amounts to 30 to 40 per cent of production.[9] Leading lead producing states are Missouri, Idaho, and Utah. Many of the problems associated with copper mining, resulting from wastes of competition and fluctuations in the business cycle, also exist in lead production.

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[8] Reserves of copper should be measured by the price at which they can be produced, and it is estimated that U. S. reserves amount to 21 million tons, and that of foreign nations, 83 million tons in terms of metal that can be produced under past prices. These are, of course, only estimates, but they give some idea of the advancing depletion of our national resources of copper. (See National Resources Board, *Report to the President*, 1934, p. 410.)

Economic problems in the zinc industry are in many cases similar to those of the copper and lead industries. The United States is the world's largest producer and consumer of zinc, as it is with the companion metals of the non-ferrous group. The zinc industry has been more successful in avoiding accumulation of excessive stocks than the copper and lead, but necessary adjustments growing out of unstable economic conditions bring about acute unemployment, stranded mining communities, and permanent loss of substantial quantities of low-grade ore, just as they do in the copper and lead industries. In some western areas, zinc is found in combination with copper and lead ores. Leading zinc-producing states are Oklahoma, New Jersey, Kansas, Tennessee, Idaho, Montana, and Utah. Outside the United States, leading zinc-producing countries are Belgium, Poland, Canada, France, Australia, Germany, Mexico, Norway, the Netherlands, Japan, and Rhodesia. No great new fields have been discovered in the United States in the last twenty years, and improvement of technology, making lower-grade deposits commercially available, has been the major factor in our reserves, which are limited. The fact that very little secondary zinc is recovered for re-use further adds to the seriousness of avoidable losses of the metal.

Only about one-fifth of the mine production of zinc is recovered for re-use. A large proportion of the total zinc used is in forms which make it very difficult to recover the metal. About two-fifths of the mine output is used in galvanizing, from which there is little recovery, and another fifth goes into brass, which involves high losses in reworking of old material. Some 15 per cent goes into pigments and salts from which there is practically no recovery, and in addition into uses for zinc involving high losses, such as precipitant for gold and silver in the cyanide process, and of silver in the process for desilverization of lead.[10]

There are numerous other non-ferrous metals besides copper, lead, and zinc, including the precious metals; but only two or three can be mentioned here. Tin is a very important product in modern industry, and one in which the United States is almost completely lacking. It is found in only a few sections of the earth, and at present is produced in only three major areas—(1) the Middle East, comprising Southern Burma, Siam, Malaya, the southern part of the Dutch East Indies, Indo-China, and the Chinese province of Yunnan, which produces some two-thirds of the world's tin supply; (2) the Bolivia and Nigeria areas, which produce roughly a fifth and a twentieth of the current output respectively; and (3) Cornwall in England, which has been known and worked for centuries, though present output is small. The United States is the world's largest consumer of tin, consuming more than a third of the total, and is almost entirely dependent upon other nations for its supply. The United States is also largely dependent upon foreign sources for its supply of nickel, almost all of which comes from Canada.

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[9] Van Hise and Havemeyer, *op. cit.*, p. 87.

[10] *Ibid.*, pp. 89–91.

Of all the minor metals, aluminum is the most important.[11] Aluminum is made commercially from bauxite, oxide of the metal, which has an aluminum content of around 50 per cent. There are, however, enormous supplies of rocks bearing from 20 to 30 per cent of aluminum which, with improved technical methods, may be made commercially available, so that potential supplies of aluminum in nature are practically inexhaustible, or at least much more nearly so than of any other metal.[12] The problem of the aluminum industry is, therefore, not one of conserving an exhausted, irreplaceable resource. It is one of price. Aluminum is high in price compared with non-ferrous metals like copper, lead, and zinc, because (1) aluminum production is basically a more expensive process, and (2) it is produced under monopolistic or very imperfectly competitive conditions. About half the world's output, including the entire United States production, is produced by a single company.[13] The problem of public policy is therefore one of bringing about economic condi-

[11] The minor metals include aluminum, antimony, bismuth, cadmium, chromium, cobalt, magnesium, manganese, mercury, molybdenum, nickel, platinum, radium, tin, titanium, uranium, tungsten, and vanadium. Aluminum is commercially by far the most important of these, and is also the most abundant in nature.

[12] According to the calculations of F. W. Clarke, the earth's crust bears a trifle over 8 per cent of aluminum in its average composition. (Van Hise and Havemeyer, *op. cit.*, p. 103.)

[13] The Aluminum Company of America (ALCOA) is not only the aluminum industry of North America, but is also powerful in the European aluminum industry. For a more detailed statement of the position of the Aluminum Company, in regard to the aluminum industry, see Zimmermann, *World Resources and Industries*, pp. 703–706.

tions in aluminum production which will make it available in large quantities at the lowest possible cost to consumers.

Precious Metals. The precious metals include gold, silver, platinum, and allied metals such as palladium, rhodium, ruthenium, osmiridium, and iridium. The higher gold price established by the U. S. government since 1934 has encouraged increased gold production, and the operation of many areas unprofitable with the previous lower gold prices. Fairly stable producing areas like the South Dakota Black Hills region have had profitable operations in recent years, but the problem in the gold-mining industry is still a matter of discovering commercially exploitable deposits. The Union of South Africa is the largest gold producer, supplying about a third of the world's output. Other important producers are Russia, Canada, the United States, Mexico, the Philippine Islands, Australia, Japan, Rhodesia, and the Gold Coast.

The high silver price policy of the United States has tended to concentrate silver stocks in this nation. Mexico, the United States, and Canada are the largest producers, with Peru, Japan, Russia, Australia, Bolivia, Burma, Honduras, and the Belgian Congo and Yugoslavia the most important other producers.

The production of platinum is concentrated in a few nations. Canada is the largest producer of the metal, with Russia second, the Union of South Africa next, followed by the United States and Colombia. The production of platinum in Alaska has had a phenomenal increase in recent years, and for this reason the United States is now the fourth largest source of platinum metals. It is also an important refining center, occupying a prominent position in the international platinum trade.

Non-Metallic Resources. The non-metal resources include the structural materials such as cement, sand, gravel, stone, lime, and clay. They also include the abrasive materials such as millstone, corundum, diamond, emery, garnet, tripoli, quartz, and sandstone; pigments, such as barite, ochre, and umber; fertilizers and chemicals, such as phosphates, nitrates, potassium salts, borates, gypsum, bromium, sulphur, salt, and arsenic; and miscellaneous materials, such as asbestos, asphalt, and graphite. The importance of these non-metallic minerals can be seen from the fact that the annual production of some of them (such as cement, building stone, and clay and clay products) in the United States each exceed in value the annual United States production of iron ore.[14]

There has been an increasing use of non-metals in the construction industries in recent years. This reflects in part the increasing price of lumber and other materials. In large cities the increased needs for fireproofing, greater strength, and the development of soundproofing have expanded the use of non-metals.

The three essential minerals used in mineral fertilizers are nitrates, phosphates, and potash. The Atacama Desert in northern Chile was for many years the world's principal source of nitrates. Today only a fifth of the world's nitrate comes from Chile, the remainder being produced by electricity or as a by-product of chemical industries. Major countries in the production of nitrates are Germany, Norway, Sweden, France, Switzerland, and the United States. France and Germany are important potash producers, as the United States is through production from its western deposits. Spain and Russia are also important producers. In the case of phosphates, large deposits of phosphate rock are found in Florida and northern Africa (Tunisia, Morocco, and Algeria). These two areas account for most of the world's production. Phosphates are also produced chemically as a by-product in the copper smelting and refining process.

The non-metallic minerals mentioned here are only a few of the hundreds that might be mentioned. Chemists are discovering new uses for many of them and some of the minor minerals of today may be the major minerals tomorrow.

DISTINCTIVE FEATURES OF MINERAL RESOURCES AND MINING

Mineral resources possess certain fundamental attributes which differentiate them physically and economically from other natural resources. Some of the more important characteristics peculiar to mineral resources are discussed below.

Irreplaceability of Minerals. The most important peculiarity of mineral resources is their irreplaceability. We have seen that forest resources are exhaustible, but not irreplaceable. When a tree is cut down, another can be planted to take its place. Soil resources, which are the product of the last few hundred thousand years, are also exhaustible, and it is true that we cannot build a new soil in the same sense that we can grow a new tree. Yet it is possible, by proper management, to rebuild or rejuvenate old, worn-out soils. It is still easier, of course, through proper cropping, rotation, and related soil management practices, to prevent soil from becoming worn out. In other words, soil productivity can be maintained or even improved as it is used. Water resources are neither inexhaustible nor entirely irreplaceable. The hydrologic cycle causes a continuous flow of water in the larger streams of the land, but proper utilization and maintenance of existing water resources demands proper attention to methods of use. Mineral resources, however, are exhaustible and irreplaceable. In other words, mining is a completely extractive industry, not a genetic one like agriculture or forestry. Consequently, the use of minerals is of peculiar importance to society as a whole, and wise use of such exhaustible and irreplaceable resources is particularly desirable.

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[14] Klimm, Starkey, and Hall, *op. cit.*, p. 263.

Highly Localized Resources. Mineral resources are unequally distributed among the nations, and occur in strictly limited areas. Agricultural crops and forests can be grown over much of the earth's surface, and most nations possess some fairly productive or good soils and water resources. However, mineral resources are so highly localized that many nations have none of some minerals basic to modern machine technology. Concentration of mineral resource control or ownership in a limited group of nations is facilitated by this extreme localization. For the world as a whole, mineral supplies are large enough so that there is little need for concern about early exhaustion, but for each individual nation there is definite danger that particular minerals may soon be exhausted,[15] which makes it essential that each nation utilize its minerals efficiently in the public interest.

"Hidden" Nature of Most Mineral Resources. Forest, soil, and water resources usually involve surface use, but most mineral deposits are hidden below the surface. Their discovery is largely a matter of chance, so that mining is ordinarily a highly speculative enterprise.

There are far-reaching economic implications of this "hidden" characteristic of most minerals. (1) The "accidental" discovery of rich mineral deposits may overnight change the utilization of the land and permit the acquisition of great fortunes. (2) Entire populations may be disorganized because of the uncontrolled, frantic effort to "get rich quick" by exploiting newly discovered minerals. (3) The extent of the deposit, or the length of the period during which operations can be continued is always unknown or uncertain, since there is no accurate way of determining just how great the hidden deposits may be, or of judging the quality of the ore at lower levels. This uncertainty or indefiniteness colors the entire economic and social life of the mining community. Popular thinking usually assumes an inevitable decline into a ghost town for all types of mining communities, largely because of the exhaustibility, irreplaceability, and uncertainty characteristic of mineral deposits. However, there are significant differences in types of mining, just as there are in types of farming, and some deposits will last for many decades at present rates of use. Moreover, the development of science has enabled mining engineers to estimate the nature of deposits more accurately, though their appraisals can at best be only good estimates. The unpredictability or uncertainty of mineral deposits is particularly pronounced where the mineral is in a liquid form, like oil, which is called the "fugitive resource." A fairly scientific appraisal of such mineral deposits or concentrations may be made at a certain time, yet many become valueless if, at a later date, the mineral shifts its location or is withdrawn by operations at another point.

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[15] C. K. Leith (ed.), *Elements of a National Mineral Policy,* The Mineral Inquiry, 1933, p. 4.

Durability of Many Minerals. Since most metals are durable, stocks of metal tend to accumulate and create problems peculiar to the mining industry. For example, the annual amount of iron available for industrial use is not merely the volume currently mined and produced, but all scrap and old iron made available by discarded or worn out machinery, tools, and structures in which iron or iron products were used. As a result of this "competition" from scrap or "secondary" metal, the price of currently produced iron is lower than it would be if the metal were used up permanently and its form destroyed in its first industrial use.

The durability characteristics of some metals, however, possess certain advantages. In the case of gold, silver, or similar durable metals, where current supply is the accumulation of generations, any great fluctuations in output from year to year do not seriously affect the total quantity available, because of the great previous accumulations. Consequently, the supply is much more constant in relation to demand, and price tends to be much more stable. This durability is one of the most important reasons for the long use of gold and silver, the precious metals, as the monetary standard of many nations.

The durability of most metals should not lead the student to believe that minerals are inexhaustible. In their native state, mineral deposits are definitely exhaustible through mining (because it is an extractive and not a genetic process). The form of the metal is changed through its use in industry, and it may not be destroyed in substance; but the mining industry, built upon the process of extracting the mineral from the earth, is destroyed through the exhaustion and irreplaceability of the mineral deposit. The many ghost towns scattered over former mining areas are mute evidence of the exhaustibility and irreplaceability characteristics, which should not be confused with the "durability" characteristics. Accumulation of metal stocks suggests one way by which modern economies can meet the problem resulting from the increasing difficulties that arise from the necessity of mining deeper and poorer ores.

Interchangeability of Minerals. Another important characteristic of minerals and the mineral industry is interchangeability. Some minerals possess unique characteristics enabling them to meet certain industrial demands and prevent the substitution of others. Many of the metals have uses peculiar to them—copper, lead, zinc, nickel, and chromium, for instance—as do the non-metal mineral products like brick, lime, cement, and asbestos. Yet metals may be substituted for each other in many instances, and though actual substitution frequently involves economic loss because of the sacrifice or non-use of the product which would be most completely or peculiarly adapted for a given use, this substitution is nevertheless of great economic significance.

The characteristic of interchangeability or substitutive quality is very important, because of the exhaustibility and irreplaceability of many minerals. Pressure of demand on scarcer minerals can be relieved by the use of substitutes. It may be said, therefore, that the scarcity of many minerals is relative rather than absolute; geologic occurrence and economic availability are not the same thing.

Mining a Large Scale Operation. Much has been written about the placer mining activities of gold rush days, where individuals panned out gold by hand and in some cases made small fortunes. However, this type of individual enterprise is not applicable to modern mining, which is generally a large-scale proposition. Mining has become highly mechanized, and with this mechanization the size of operating units has increased. Even the mining of precious metals, particularly gold and silver, is now a large-scale proposition usually operated in connection with the production of metals like zinc, lead, or copper. Modern large-scale, highly mechanized operations make it economically possible to recover the small traces of gold and silver often found in copper, lead, and zinc ores. The greater abundance of low-grade ores made economically available through mass production and modern chemical methods is one of the more important reasons for the large operating units increasingly used in mining.

Peculiar Labor Situations in Mining. Labor conditions in mining areas have been notoriously bad. Large amounts of unskilled labor were formerly used for mining operations, and mines were usually located where there were practically no alternative economic opportunities for laborers. Unionization of mine workers in many areas has contributed much to the improvement of miners' living conditions and incomes, but even where unionization prevails many problems peculiar to mining operations still exist. Many types of mining are injurious to the health of laborers. Explosions, floods, high temperatures, excessive humidity, harmful dusts and gases, and falling rocks are also common hazards of mining. The accident rate in mining is about double that of any other industry. In addition to these may be mentioned the economic hazards of a shifting or uncertain industry, and the fact that the industry is a temporary one because of its extractive nature and the irreplaceability of the deposits, which in most areas are relatively soon exhausted. For these reasons, the level of economic and social well-being of miners is usually considered below average, particularly where unionization has not occurred.

Diminishing Returns or Increasing Costs in Mining. The exhaustibility of mineral resources is the most important single factor tending to cause an increase in operating costs as mining continues. Obviously, richer and more readily accessible deposits are mined first; and as these become exhausted, operations proceed to poorer and less accessible deposits. In some instances, development of mining techniques and modern machinery make it possible to overcome these conditions without any increase in unit costs; but more frequently a point is soon reached where production costs tend to increase. More efficient management, improved techniques, new machinery, discovery of new bodies of rich ore, expansion of transport facilities, and similar factors may interrupt this tendency; but the trend toward increasing costs is unmistakable. However, technology has advanced more rapidly than discovery or transport during the present century.

This success of man-directed forces in offsetting or overcoming the increasing natural difficulties involved in continued mining should not cause the student to overlook the fact that the Principle of Diminishing Returns is particularly applicable to extractive industries, and that, in the long run, the tendency toward increasing costs because of ultimate exhaustibility and irreplaceability is a force which should encourage wise and economical use of mineral resources at all times. The student should also remember that technological advance, discovery, and improvement in transport facilities do not occur in all nations at the same rate or reach the same level at the same time. Within a nation like the United States, much migration from old to new mining fields has occurred, which is quite as much a sign of increasing costs in the old areas as it is of abundant and more economically available resources in the new. In the United States, many once famous districts have already been exhausted, and production is continued by turning to new fields or to sources of lower-grade ore which can be operated efficiently with modern techniques. For example, petroleum pools ordinarily reach their peak in a few years—often a few months—after discovery of the well. Then follows a rapid decline, and ultimate abandonment and migration to new fields or pools.[16]

FUTURE MINERAL LAND REQUIREMENTS AND RESOURCES

The mineral output of the world for the past 60 years has closely paralleled the expanding volume of industrial production. Metallic minerals have been produced in increasing amounts to meet the demands of the manufacturing, transportation, and communication industries.[17] The mineral fuels—coal, oil, and natural gas—have been required in increased amounts to meet the greatly expanded world consumption of power, heat, and light.

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[16] The interval between discovery and the telltale appearance of salt water in the marginal oil wells is said to be, characteristically, from 18 months to 3 years. (See F. G. Tryon, and Margaret H. Schoenfeld, "Utilization of Natural Wealth," *Recent Social Trends* [Report of the President's Research Committee on Resource Trends], McGraw-Hill, 1933, p. 83.)

Trends in Mineral Land Utilization. Output expansion has not been uniform for all minerals or for all countries. Some nations are still in the expanding stage of production; others are on the decline. For the world as a whole, however, the trend has been upward, the index for world mineral output being about 115 just before World War II, compared with an index of less than 20 in 1880, using 1929 as 100.[18]

Although the trend is generally toward increased mineral resource utilization, present conditions and prospective utilization may vary greatly among specific minerals. In some cases, the trend of utilization is downward, due to discovery of more useful substitute products or to exhaustion of deposits, or a combination of factors. In the case of some other minerals, utilization remains about stationary, and there are no important problems of conservation or economic difficulties involved. In still others, consumption is expanding rapidly in line with advancing technology, or reserves are comparatively small and serious economic problems of utilization and conservation are developing.

It is thus impossible to discuss future mineral land utilization, except in very general terms, without going into a detailed analysis of individual minerals. Suffice it to say here that some nations have already acknowledged the necessity of establishing policies in which public control and direction are used to conserve vital resources, by reducing wastes involved in controlled exploitation and use. In the United States, private enterprise has been allowed to exploit exhaustible and irreplaceable minerals freely and, with the increasing importance of some of the more strategic and critical of these in domestic, defense, and war activities, it is only common sense to expect increased public intervention or, in some cases, public ownership, to control the use of many minerals on a less wasteful basis.

Future Supplies of Minerals. The geography of mineral production has undergone notable shifts in the last three decades because of discoveries, commercial exploitation of deposits already known, exhaustion of older districts, new technologies of extraction and use, and substitution.

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[17] C. K. Leith, J. W. Furness, and Cleona Lewis, *World Minerals and World Peace*, The Brookings Institution, 1943, p. 8.

[18] *Ibid.*, p. 9.

The rate of discovery is declining. Although some important discoveries have been made recently, they do not as a whole compare in number and magnitude with those in the decades before World War I, when most of the great regions of production of iron, coal, oil, gold, and other minerals were found. Discoveries of the future will come more largely than in the past from deep exploration in known districts and as a result of new techniques of exploration. The principal areas where these methods will be applied have been mapped out long in advance. There is hardly room left on the earth's surface, according to experts, for discovery of such really great mineral districts as the principal coal fields, the Lake Superior, Brazilian, and Indian iron ores, the great placer gold deposits of California, the placer tin deposits of the East Indies, the Rand gold district of South Africa, or the principal copper districts of the United States, Chile, and Rhodesia.[19]

The exhaustion of productive mining districts has caused notable shifts in mineral production. Some of the most productive mining districts in the United States have reached near-exhaustion. These include: the Comstock lode and the Goldfield district of Nevada; the Leadville district of Colorado; Lake Superior copper of Michigan; certain oil fields in Pennsylvania, Ohio, Kentucky, Texas, Oklahoma, and California; and many others. The United Kingdom was at one time the world's largest producer of tin, copper, lead, and zinc. Today coal is being mined at more than 3500 feet underground, some from seams as narrow as 14 inches, yet less than 7 per cent of the total reserves of coal of the United Kingdom have as yet been taken from the ground.[20]

The probable life of most mineral deposits and production districts is now approximately known, according to experts. For example, known copper supplies of the United States are estimated to last about 30 years; zinc deposits, 20 years; known oil, less than 20 years, and prospective oil, possibly 40 years; Lake Superior iron ores of present commercial grades, 30 years; coal, upwards of 3000 years; natural gas, 33 years; and mercury, 5 years.[21] However, long before the exhaustion period, there will be curtailment of production forced by increasing difficulties of mining.

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[19] *Ibid.*, p. 88.

[20] *Ibid.*, p.89.

[21] *Loc cit.;* and *Our Oil Resources, op. cit.*, p. 142.

Technological improvements have greatly widened the range of useful minerals and increased the amounts available for use. The substitution of more abundant materials for scarce minerals helps to ease the problem of supply. Some examples of technological advance include better ventilation methods which permit lowering of the effective depth to which mining can be carried; flotation process of concentrating ores, making it possible to exploit large tonnages of low-grade copper ores; and purification of smelter and other gases providing important supplies of by-product metals. Whereas the encroachment of substitutes has often been feared as bringing about the end of a given mineral industry, it cannot be proved statistically, at least up to the present time, that any substitutions yet undertaken have materially changed world requirements for the principal minerals.

Mineral Control and Peace. A modern war cannot be fought without huge quantities of a few minerals, and smaller amounts of many others. For example, in World War II, nearly a hundred minerals were in use. If accumulation of minerals for war purposes is to be prevented, two essential conditions must be met: (1) There must be preponderant possession of the world's mineral resources by those who elect to prevent would-be aggressors from storing up supplies; and (2) machinery for the control of minerals must be in operation before actual outbreak of war.[22]

Effective administration of a mineral control plan would require close cooperation of all mineral-producing nations. Either mineral resources would have to be continuously allocated by the over-all governing body to the various nations in the light of peacetime needs or, as a minimum, controls would have to be instituted at any moment when investigation indicated that a certain nation or nations might be starting to build up abnormal supplies. The perfection and use of the atomic bomb by the United States at the close of World War II, and its appalling effectiveness, emphasized the great need of a strong world organization to establish and maintain world peace. Such a world organization with adequate powers and the full cooperation of a majority of the nations, including the great powers, should be able to control the utilization of mineral resources in the interest of peace.

[22] Leith, Furness, and Lewis, *op. cit.*, p. 201.

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CHAPTER ELEVEN

WATER RESOURCES

NEARLY three-fourths of the earth's surface is covered by water, so that in the aggregate there is an abundance of water. Its distribution, however, is such that some areas have excessive moisture, while many areas have an amount insufficient for the more important uses to which water is put by man.

THE SUPPLY OF WATER

The amount of water available for man's use varies considerably among the continents of the earth, as do also the numbers of their inland streams, rivers, and lakes, or their access to large adjacent bodies of water in the form of oceans, straits, gulfs, or seas. The proportion of the areas of each continent receiving a given annual amount of precipitation follows:[1]

	Under 20 In.	*20–40 In.*	*Over 40 In.*
AUSTRALIA	66%	22%	12%
AFRICA	54	18	28
ASIA	67	18	15
NORTH AMERICA	52	30	18
EUROPE	47	49	4
SOUTH AMERICA	16	8	76

Availability of Water. There are few areas on the earth where water is not available, or where it cannot be made available with some human effort, to furnish an adequate supply for human consumption, even if it must be used sparingly for other purposes. There is enough fresh water in the world to irrigate all the arid and semi-arid lands physically suitable for agriculture; but the juxtaposition of water bodies, or sources of water supplies, and suitable arid and semi-arid lands is such that only a very limited percentage of the total area can be economically irrigated. Some 20 million acres out of a possible 50 million in the United States are under irrigation.

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[1] Griffith Taylor, "The Frontiers of Settlement in Australia," *Geographical Review,* January 1926.

The most important physical factors limiting the use of water for generating power are volume and rate of stream flow. The amount of water power which can be developed from a given stream during the period when it is at its lowest ebb has been defined as *firm power,* or the amount of horsepower that can be developed on the basis of the flow for the period of two weeks in which the flow of the stream is least. The amount of firm power may be much less than that which can be developed during the high-water months; but if the demand for power is fairly constant during the year, firm power will be the limiting factor determining the horsepower which can be depended upon to satisfy human needs.

Scenic values, fishing possibilities, swimming facilities, winter sports, boating, and similar opportunities give bodies of water their recreational value. A greater range of physical qualities can be used effectively to satisfy recreational demands than can be used in the generation of power or utilization of water for human consumption, or for irrigation. Thus, the potential economic supply of water for recreational use is greater than that for the other uses mentioned.

Use of water for navigation and transportation is limited by physical location and depth of the water. Six feet is generally considered the minimum depth for commercial navigation. In many cases, governments and private individuals have deepened stream courses to six feet or more, making year-round navigation possible upon streams formerly navigable only part of the year, or not at all. The economic supply of water for transportation, however, is limited largely by depth and by physical location relative to domestic and international markets. An example of the extreme importance of physical depths of streams can be seen in the effect of fluctuations in the height of water on Great Lakes shipping. It is claimed that for every inch of decrease in the height of water on the Great Lakes in periods of extreme drought, there is an annual loss to shipping interests of several hundred thousand dollars. The big ore boats cannot be loaded to full capacity, and there is a consequent loss in freight earnings for each inch of reduced displacement. During years of low water, increased cost must be incurred to deepen water at the terminals; but this deepening, together with that necessitated in the channels between the lakes, has lowered the general water level.

Attributes of Water Resources. Water occurs generally in such abundance as to be a free good, though in some areas it is very scarce. In most uses it is very scarce, indestructible, and may be used repeatedly.

Water, like forests, is a multiple-use resource, and its uses are not necessarily exclusive. For example, in the case of hydroelectric developments for producing water power, the water is still available for transportation, for irrigation, for navigation, or for recreation. It might even be used for drinking purposes, since its quality is not affected by its use for hydroelectric purposes. In many instances, these various uses supplement one another, and make possible the development of various enterprises which would not be justified by a single use. For example, it may be economically feasible to build an expensive irrigation dam if the water stored behind the dam can be used, at least in part, for the development of electric power (which constitutes an additional source of revenue to cover part of the construction cost). These various uses, however, may be antagonistic. To some extent, for example, hydroelectric power and irrigation uses are competitive. Water resources must be carefully studied and their uses adjusted to prevent one desirable undertaking from destroying another use which may be even more important.

THE DEMAND FOR WATER

Major Uses of Water. Water is used in a great many ways to satisfy man's wants. Major uses made of water are: (1) for domestic and municipal water supply for human consumption or use, (2) for transportation of waste, (3) for food production—production of fish and similar sea food, and for agricultural production through irrigation, (4) for water power, through hydroelectric development, (5) for recreation, as discussed in Chapter IX, and (6) for navigation, discussed in Chapter XII. As we have seen the use of water for some of these purposes does not necessarily prevent its use for another.

Beneficial uses of water are of two main types—*usufructuary* and *proprietary*.[2] Under the former are water power, navigation, and fisheries, in which only rights in the water as it flows past—in the *use* of the water—exist. Under the latter, ownership tends to be in the *substance* of the water itself, as in domestic, municipal, or industrial uses, and irrigation. Drainage and flood control activities are attempts to overcome destructive or harmful effects of water.

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[2] R. T. Ely and G. S. Wehrwein, *Land Economics*, Macmillan, 1940, p. 361.

Utilization of Available Water Supplies. Less than a third of the waters of the United States are utilized by man. About a third of the total precipitation falling upon the earth in the form of rain or snow remains on the surface and runs off toward some lower point; the rest disappears into the soil, or returns to the atmosphere ("flies off") through evaporation. This runoff, in many cases, takes the form of floods, which may be very destructive; or the runoff may wash the soil and cause erosion. Of the total runoff, it has been estimated that less than one-half of one per cent is needed for domestic or municipal purposes. About 2 per cent of the runoff, or possibly as high as 10 per cent in arid and semi-arid regions, is used for agricultural purposes. About 5 per cent is used for navigation, and less than 10 per cent for water power.[3] Thus, less than a third is utilized for these combined purposes—far less than could or should be utilized under well-developed plans.

One of the reasons for this failure to develop fuller use of water resources is that in areas where water is relatively abundant it is accepted as a gift of nature without careful consideration of its economic importance and the need for development programs in the semi-arid and arid regions where it is not plentiful. Thus, there has not been full appreciation, on the part of the public as a whole, of the need and possibility of more complete water control and utilization.

USE OF WATER FOR IRRIGATION

In arid and semi-arid regions water is so scarce that it is the strategic or limiting factor in the agriculture of these areas, and its wise use is of the greatest importance. In the United States, irrigation is confined largely to the seventeen western states and more particularly to the area west of the 98th meridian (see Figure 33).

Extent and Importance of Irrigation. The total irrigated acreage of the United States is less than 2 per cent of the land area of the nation, with California, Colorado, Idaho, Montana, Utah, and Wyoming leading in acreage irrigated. The number of farms on irrigated lands amounts to about 5 per cent of the total farms of the country, and the value of land and buildings on irrigated farms is about 10 per cent of the total value of all farm land and buildings of the nation. About three-fifths of the irrigated acreage is devoted to production of crops for harvesting, the rest being used for pasture or other purposes. Of the acreage devoted to harvested crops, almost half is devoted to production of hay (principally alfalfa); another fourth to production of cereals (principally wheat, barley, and, in Louisiana, rice). The remaining fourth is devoted to cotton; sugar beets; small vegetables, including potatoes, beets, beans, peas, carrots, lettuce, asparagus, etc.; and to fruits and nuts, including apples, peaches, plums, pears, apricots, figs, cherries, oranges, lemons, grapefruit, olives, strawberries, raspberries, and walnuts.

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[3] F. H. Newell, "Water," in L. H. Havemeyer (ed.), *Conservation of our Natural Resources,* Macmillan, 1930, p. 135.

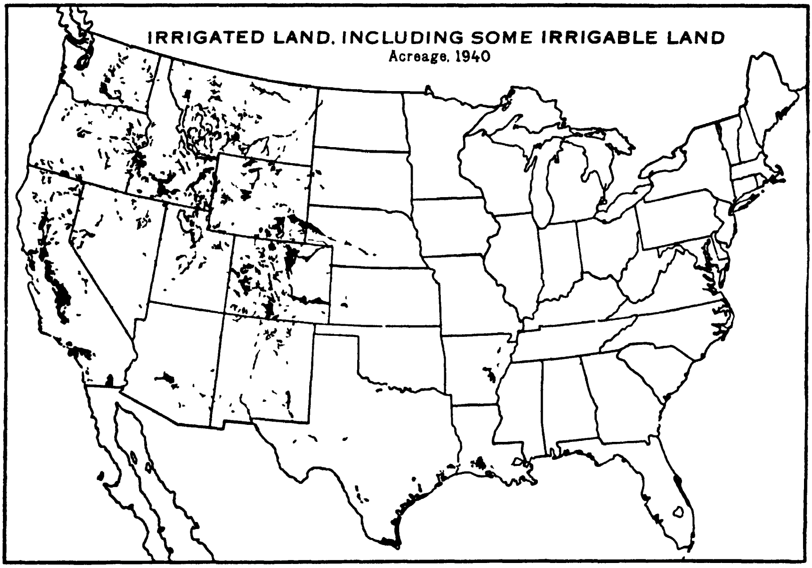

FIGURE 33. Irrigated Lands of the United States, 1940. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

The high proportion of the irrigated acreage devoted to hay and cereals indicates the important place of irrigated land in the livestock industry of western arid and semi-arid states. Most of the hay produced is used for feeding livestock (largely beef cattle and sheep, although a considerable number of dairy cows are kept on irrigated farms). Much of the grain raised on irrigated land is also utilized by the livestock industry for winter feed or for feeding of dairy cattle.

Types of Irrigation Enterprises. About a third of the total irrigated area of the United States is in enterprises undertaken by individual and partnership effort. These are, for the most part, small undertakings where very little construction and development work was required to get the water onto the land. Consequently, these irrigation enterprises are in general the most inexpensive, and therefore were developed first. Another third of the total is in enterprises undertaken through cooperative associations. Some of these are comparatively large undertakings, but most of them are small and did not require any large construction or development efforts. Of the remaining one-third, more than half the necessary construction and development work has been undertaken through organization of irrigation districts, and the rest principally through commercial or private corporation undertakings, or the federal government.

In recent years, particularly during the thirties, the federal government has been active in financing additional irrigation enterprises. Since the U. S. Bureau of Reclamation was established in 1902, it has placed irrigation works in operation to serve nearly 4 million acres of land, of which 2½ million were once unproductive desert, and 1½ million were in non-federal irrigation districts with inadequate water supplies.

The present construction program planned in anticipation of a large public works and employment program following World War II is the largest in the Bureau's history. Over 400 projects are included in the program which would extend irrigation to 10 million acres of new land, and furnish supplemental water for an additional 11 million acres of land now without adequate irrigation supplies. Approximately 135,000 new irrigated farms would be created and the livelihood of more than 150,000 additional farm families would be stabilized in areas where maximum crop production is uncertain because of a deficient water supply. The same reservoirs that would impound the storage water for this irrigation could provide more than 4 million kilowatts of firm power for industrial use.[4] Through revenues derived from sale of this energy, projects not otherwise economically feasible for development can be undertaken. Cost of construction of the projects is estimated at around 5 billion dollars and if completed will extend the services of the Bureau of Reclamation to areas in which more than 10 million persons reside.

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[4] Annual Report of the Secretary of the Interior, "Annual Report of the Commissioner of the Bureau of Reclamation," Government Printing Office, 1944, pp. 5 and 6.

Expansion of cultivated acreage in the West has not kept pace with the increase in population. Since 1920, the number of people living in the far western states has increased more than 60 per cent, while the irrigated acreage has increased only 10 per cent. The increased activity of the federal government in irrigation projects has been closely associated with its public works and employment programs designed to furnish economic opportunities for unemployed and dislocated workers. Some of these projects, like the Grand Coulee Dam on the Columbia River in Washington, the Boulder Dam Project on the Colorado, and the Fork Peck Dam on the Missouri in Montana, are very large undertakings involving hundreds of millions of dollars—sums which could not be readily financed by individual, cooperative, or state and local governmental action, and projects not likely to be undertaken by private concerns. In many cases, production of hydroelectric energy is an important part of the project.

Federal Irrigation Laws. The first federal legislation in the United States on the subject of irrigation or use of water from streams for this purpose was recognition of local customs, rules, and court decisions, in the act of July 26, 1866. By this act, together with an amendment approved in July of 1870, the federal government surrendered any control it might have had over the non-navigable streams of the arid region, by reason of its ownership of the lands of that area.[5] This law is usually considered the "Magna Charta" for state control of non-navigable streams in the arid regions. Whether the rights of the states are based on this act, or merely recognized by it, it does represent a distinct and important policy, and one which has been much discussed in recent years with the increasing activities of the federal government in irrigation development.

Passage of the *Desert Land Act* on March 3, 1877, provided for granting title to 640 acres of arid land (reduced to 320 in 1890) to an individual in consideration of his conducting water upon it, paying $1.25 per acre, expending at least $3 per acre in improvements, and actually reclaiming at least an eighth of the land. The Desert Land Act had a very important weakness, in that the land could not be made security for the cost of irrigation, so that unless the individual could do his own irrigation development work, or have it done by agencies that could provide the funds, irrigation development was impossible. Compliance was completed on less than 9 million acres under the act, although nearly four times this much were originally entered for settlement.

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[5] R. P. Teele, *The Economics of Land Reclamation in the United States,* Shaw, 1927, pp. 61–62.

Congress tried to remedy the weakness of the Desert Land Act by making the cost of irrigation development a lien on the land in the *Carey Act*, passed August 18, 1894. Under this act, the federal government ceded to each state containing arid land a limited acreage (one million acres, additional acreage being granted to Wyoming and Idaho in 1908 and to Colorado in 1911) on condition that the states provide for the development of irrigation on these lands. The federal government did not furnish any funds to assist in this development, and left the details to the states themselves, except that they were forbidden to lease lands or dispose of them in any way except so as to secure their irrigation, cultivation, and settlement, and that they could not sell more than 160 acres to any one person.

Under the Carey Act, the states contract with construction companies for building the irrigation works to develop specific areas of public lands to be claimed by the states. The construction companies may sell water rights to reimburse themselves for the construction cost, while the states sell the land, (agreeing to sell the land only to parties who have contracted for the purchase of water rights). In this way, the land and the water are brought together for more effective development and use of the irrigation works. However, in spite of numerous amendments since its original passage, the Carey Act has fallen far short of its anticipated goal. There are several reasons for this: First, state officials elected for political reasons, without any necessary ability or particular interest, were generally overloaded with routine duties, and could not or did not take the time or display the far-sighted vision needed. Second, corporations formed to irrigate and sell these lands were essentially speculative. Third, the supply of water was inadequate in many areas selected for development. Fourth, constitutions of many states in the arid region forbade them to extend credit to private undertakings, so that they could not undertake actual irrigation development, or even lend their credit to communities of settlers or companies to accomplish it. Fifth, the act fixed 10 years from passage of the law for completion of any project undertaken, and although this was amended in 1901 to a possible 15 years from date of approval of the project by the Secretary of the Interior, the time is still too short to undertake a job of irrigation development of any magnitude. Sixth, the most important and fundamental cause was that there was not a real need for more farm land.[6]

Passage of the *Reclamation Act* of June 17, 1902, definitely committed the federal government to a program of irrigation development. The act provided for government construction of irrigation works, with provision for repayment of construction cost by those who use the water. It established a revolving fund for irrigation enterprises from receipts from the sale of public lands. Costs of construction of irrigation projects were to be repaid by settlers who took up irrigated land, but costs were not to include interest. Subsequent legislation has enlarged the scope of the act[7] and enlarged the sources of additions to the reclamation fund; but the principles of repayment and reinvestment in further irrigation development have been retained.

The original Reclamation Act of 1902 spread repayment over a period of ten years, without interest on deferred payments, but the repayment problem became so acute that numerous acts have since been passed to extend the period and change the plan of payments. In 1914, passage of the *Extension Act* increased the time of repayment from ten years to twenty years, with allowance of a grace period of five years before payments had to begin, with payments to be completed in fifteen annual installments. The Extension Act also prescribed that each man's holding was to represent a "farm unit," the exact size to be determined for each project by the Department of the Interior. This flexibility in size of unit was an attempt to shut out speculators and also to make operation of the act more adaptable to varied conditions of soil, enterprises, markets, and production costs peculiar to various federal irrigation projects. Unfortunately, on some projects the acreage set by the Department as constituting a "farm unit" was too small, and resulted in serious problems.

During the general business depression and low agricultural price period which prevailed immediately after the First World War, settlers on federal irrigation projects had increasing difficulty in making their payments, and on May 17, 1921, Congress passed a public resolution permitting the Secretary of the Interior to furnish irrigation water during 1921 to water-right applicants who were delinquent in operation and maintenance payments, in spite of the fact that the Extension Act provided that any settler who was more than one year in arrears in his payments could not secure any irrigation water services from the government. Continuance of unsatisfactory conditions led the Secretary of the Interior to appoint a committee in 1923 to go over the whole problem of federal irrigation development and repayment, and make recommendations for improvement. This committee, known as the *Factfinders Committee,* made the following recommendations in 1924: (1) That the twenty year limit for making payments be abandoned, and that repayment of construction costs be changed from an annual payment of a percentage of the total cost to a percentage of average annual returns. (2) That if, after a careful survey of construction costs and soils, it were found that present construction costs per acre were more than the lands could bear, a fair and equitable adjustment be made to fix the charge per acre at a sum the land could reasonably bear. (3) That justifiable temporary relief be provided by Congress. (4) That construction costs apportioned to land that could not repay them be suspended and ultimately charged off. (5) That a credit fund be established from which settlers could borrow funds at a low rate of interest to make permanent improvements or buy livestock and equipment. (6) That agricultural advisors be employed to give sound agricultural and business advice to enable settlers to increase their farm incomes.[8]

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[6] Thomas, Teele, and Newell each stress one or more of the above reasons, although none lists all of them. See George Thomas, *The Development of Institutions Under Irrigation,* Macmillan, 1920; Teele, *op. cit.;* and Newell, *op. cit.*

[7] Passage of the *Warren Act* in 1911 authorized the sale of surplus water from federal project works to provide supplemental water for lands already irrigated.

In 1924, Congress passed an act adopting the first four of the six major recommendations of the Factfinders Committee. The acceptance of the new repayment basis (percentage of the value of the crop) was optional with water users. The act of May 10, 1926, renewing appropriations for new projects, provided for repayment periods of not more than forty years on new projects, and left details to the Secretary of the Interior. On May 25, 1926, Congress passed the so-called "*Omnibus Reclamation Act,*" which repealed provision for the crop plan of repayment, except as to contracts already in force or being negotiated at the time, and the forty year plan was established for both old and new projects.

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[8] The report also made other recommendations. For a more detailed statement, see Teele, *op. cit.*, p. 78.

Recent Irrigation Legislation. The repayment situation on many federal irrigation projects again became acute during the thirties; and on May 31, 1939, Congress passed an act authorizing the Secretary of the Interior to extend relief to water users who were unable to pay construction charges without great hardship for the calendar year 1938 and for prior years. The *Reclamation Project Act* of 1939, enacted into law August 4, 1939, extends the provisions of the act of May 31 for each of the years 1939 to 1943, inclusive, and provides specific measures for adjusting economic and financial problems on federal irrigation projects. It makes possible the drafting of new contracts gearing repayments to ability of farmers to make payments year by year, and the accomplishment of other needed reforms. The act provides for extending the time for payment of construction charges, where justified, to not more than forty years from the date of the first installment, or not to exceed double the number of remaining years. It also reestablishes the principle of the crop payment plan for repayment by providing for adjusting annual charges on the basis of current crop values. If these two provisions are not adequate, new contracts can be negotiated providing for fair and equitable plans of repayment after approval has been given by Act of Congress.[9]

Congress has shown its continued interest in encouraging further irrigation development in arid and semi-arid regions by recent additional legislative acts. The *Water Facilities Act,* approved August 28, 1937, authorizes the Secretary of Agriculture to construct new water facilities, acquire any necessary lands and water rights, sell or lease water facilities, or enter into agreements with or furnish financial or other aid, if he feels it is warranted, to any agency or person. The facilities included within the program may be located on private or public lands. The act represents a broad program to encourage and assist in developing water facilities, including small reservoirs, dams, wells, etc., in range areas or dry-land farming areas of the arid and semi-arid regions, on the ground that these smaller water facilities play an important part in the wise use of an area's land resources, in cases where large irrigation dams are neither feasible nor desirable. The *Case-Wheeler Act,* approved August 11, 1939, and amended October 14, 1940, provides among other things, that expenditures for construction, maintenance, operation, rehabilitation, or financial assistance of any one project undertaken in pursuance of the Water Facilities Act shall not exceed $50,000 of federal funds. Moreover, contracts entered into between the United States and water users for lease, purchase, or employment of these lands are to provide for annual or semi-annual payments in number and amounts fixed by the Secretary of Agriculture; but in no case shall they exceed fifty years from the time the land is first settled upon.

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[9] Annual Report of the Secretary of the Interior, "Annual Report of the Commissioner of the Bureau of Reclamation," Government Printing Office, 1940, p. 103.

Also, expenditures from federal appropriations to meet construction costs allocated to irrigation cannot exceed one million dollars for dams and reservoirs in any one project undertaken under the provisions of the Case-Wheeler Act. These provisions reflect the tendency of the federal government to encourage construction of smaller irrigation projects and related water facilities to stabilize individual farms and ranches, rather than to construct only monumental dams, like the Grand Coulee project, which bring into production large tracts of new land.

The *Flood Control Act* of December 22, 1944, provides that the use of water for navigation in states lying wholly or partly west of the 98th meridian shall be only such use as does not conflict with the beneficial consumptive use of water for domestic, municipal, stock water, irrigation, mining, or industrial purposes. This declaration of policy settles the question of priority of use of water in the arid and semi-arid west. In addition to providing a water "bill of rights," the act charted a new course for multiple-purpose development of river basin areas for the nation by defining the duties and coordinating the work of various federal agencies, and providing for state participation in the development of land and water resources.

Under the Flood Control Act, Congress recognizes the interests and rights of the states in water utilization and control to preserve and protect established and potential uses for all purposes. Provision is made that investigations which form the basis of development plans shall be conducted by federal agencies in such manner as to give the affected states the information developed, and the opportunity for consultation and cooperation in the investigations with the federal agencies in charge. If there is disagreement on plans among the federal agencies or between the federal agencies and the states, federal agencies must submit to Congress the views of those disagreeing with them along with their own recommendations.

When investigations concern the use and control of waters arising in the West, the Army Engineers and the U. S. Bureau of Reclamation and other interested agencies are required to cooperate in their investigations and plans. Investigations of watersheds, undertaking measures for runoff and water flow retardation, and soil erosion prevention on watersheds are under the jurisdiction of the U. S. Department of Agriculture. The Army Engineers are authorized to construct, maintain, and operate public park and recreational facilities in reservoir areas. They are also assigned the duty of prescribing regulations for use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with federal funds. The Secretary of War is authorized to make contracts with states, municipalities, private concerns, or individuals for domestic and industrial uses of surplus water available at any reservoir under control of the War Department. The Secretary of the Interior, in whose department is placed the Bureau of Reclamation, is authorized to build reclamation works to utilize surplus water of flood control reservoirs after making a report of findings as provided in federal reclamation laws.

Federal irrigation policies might be briefly summarized as encouraging, over a period of many years, the development of additional irrigation enterprises. The policy of irrigation development has been based largely on the belief that these lands would provide homes for new settlers, and that production of additional farm products would make possible a more profitable economy generally. Integrated industrial and agricultural development is one of the basic prerequisites for orderly economic growth of the West. In recent years, Congress has openly committed itself to developing newly irrigated public lands as a means of providing opportunities for unemployed and stranded families, and to assist returning servicemen of World War II to reestablish themselves in civilian life. During World War II, federal reclamation projects paid big dividends by helping to provide the needed electric power to operate airplane factories, aluminum and magnesium plants, shipyards, and other industries that made fighting equipment, and to produce the needed food and fiber for the armed forces, civilians, and allies.

State Irrigation Policies. With increased federal activity in irrigation and control and development of water resources, many western states have passed legislation permitting fuller cooperation with the federal government, and permitting construction or sponsoring irrigation enterprises with the assistance of federal appropriations. Although few states have attempted to plan comprehensively for water uses within their boundaries,[10] several of them began to undertake this important work in the late thirties in cooperation with the National Resources Planning Board and its consultants.

The proposed creation of several river basin authorities patterned after the Tennessee Valley Authority for such western areas as the Missouri River Basin and the Columbia River Basin has made the states in these areas more conscious of the need of sound irrigation development and wise use of water resources. Active state reclamation associations and state water-conservation boards are operating in several of these states. Consequently, more effective cooperation of federal and state agencies should be possible in future years in development and utilization of water resources.

Major Irrigation Problems. Some of the more important problems associated with the existing water utilization pattern for irrigation include: (1) Development of additional storage at reasonable cost (since many lands now irrigated require additional water for an adequate supply). (2) Limitation of areas to be irrigated to available water supplies. Many irrigation enterprises have been developed in which irrigated acreage is overexpanded so that during dry years, serious losses, troublesome litigation, and urgent requests for public assistance occur. (3) Existence of too many small irrigation organizations on a given stream. Pooling a complexity of water rights would simplify administration, reduce operating costs, and eliminate much of the litigation which would otherwise result from attempts to preserve priority of individual water rights.[11] (4) Failure to utilize water for its highest and best use in many areas.

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[10] Hynning states, "State attempts at the comprehensive planning of water uses are few in number at the paper stage, and obviously fewer or perhaps nonexistent at the stage of administration. Only a handful of instances have come to the attention of the writer, after extensive investigation and conferences with water specialists." (C. J. Hynning, "State Conservation of Resources," National Resources Committee, 1939, p. 61.)

[11] Cf. National Resources Planning Board, *Report to the President*, 1934, p. 344.

In many regions of the West, irrigation is the highest and best use for much of the water, but in some instances water use projects constructed for navigation and flood control have hindered irrigation development. (5) Failure to apportion irrigation costs properly. In the past there has been little use of the principle of apportioning costs of irrigation development on the basis of benefits received from such development. Arguments advanced for government irrigation enterprises are based largely on benefits to communities where projects are located, rather than merely on benefits to settlers who are to operate the irrigated lands. Businessmen of the communities which service such irrigation areas benefit not only from the construction of the irrigation works, but from the expenditures of the settlers in bringing land into cultivation and of operating the lands. On irrigation enterprises developed by private initiative, the settler is expected to repay the entire cost of the irrigation development, with interest. Spreading cost of the irrigation development over all property to be benefited directly or indirectly, rather than merely over the property to be reclaimed, is a much more sound and equitable policy of irrigation development.[12] Cost of construction, operation, and maintenance could be made general obligations of districts, to be met by a general property tax, while water users could be charged rates fixed on the basis of the value of the water to the farmers, and not of a return on the investment. Such rates might be fixed as a percentage of the returns from the land, and the revenue thus secured might be applied to the cost of the irrigation enterprise, thus reducing the amount to be raised by taxes.

In projects involving irrigation and other purposes such as generation of power, flood control, navigation, or furnishing of municipal water supplies, costs of development should be apportioned as accurately as possible to those various uses in terms of estimated benefits. For example, in the proposed Bureau of Reclamation-Army Engineers plan for development of the Missouri River Basin, the estimated total development cost of about 1½ billion dollars is allocated as follows: flood control, 454 million dollars; navigation, 132 million; irrigation (40 annual payments), 298 million; power, 576 million; and municipal water, 20 million.[13]

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[12] Teele points out that spreading the cost over property other than the land to be reclaimed will tend to check the demand for irrigation when it is not needed but, at the same time, should not seriously retard irrigation development if there is a real need for such an undertaking. Private enterprise would still be free to reclaim land when it appears that the land itself can pay the cost. (Teele, *op. cit.*, p. 327.)

Future Irrigation Development. The urgent need of developing economic opportunities for stranded and migratory farm families in the drought and in the depression thirties, and the contribution which irrigated areas made in industrial and agricultural output in World War II have emhasized the possibilities of expanding irrigation enterprises in the future as a desirable national policy. Though some irrigation projects undertaken in the thirties would not have been considered economically feasible in earlier years, they have been approved by the federal government because unemployed persons could be utilized in developing them, and operating units for World War II veterans and stranded families could thereby be made available. The far-reaching benefits of certain large multiple-purpose projects, including control of floods and generation of low-cost power, make some projects that are not economically feasible from a strictly irrigation development standpoint economically sound and desirable.

The total area in the United States susceptible of irrigation has been estimated at approximately 51½ million acres,[14] or nearly 2½ times the present irrigated area of 21 million acres. Just what proportion of these additional acres will be irrigated, and when, will depend upon numerous economic, physical, and political factors; but in any case, development will undoubtedly be largely by the federal government, because of the large size, complications, and expense of most of the projects that remain to be developed.

DRAINAGE

Too much water may be just as bad as too little. In some areas, too much water causes serious damages through floods, erosion, or waterlogging of the soil, which makes successful crop production impossible. Too much water is harmful to plant growth, and means must be devised to remove this excess.

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[13] "Putting the Missouri to Work," Bureau of Reclamation, U. S. Department of the Interior, Government Printing Office, Washington, D. C., 1945, p. 18.

[14] Assuming that about 85 per cent of the ultimate total will be served by surface waters, the total annual draft on surface waters would be 85 million acre feet, which would require a storage of some 175 million acre feet, or twice the present reservoir capacity in the arid and semi-arid areas of the United States. (See National Resources Planning Board, *Report to the President,* pp. 344–345.)

In many parts of the more humid areas, lands are so poorly drained that they are unsuitable for crop production. In many cases, these swampy areas are comparatively fertile, because of the accumulated decay of aquatic vegetation, but this is not always true. Millions of acres of productive land have been made available for crops in the United States, particularly in Illinois and along the tributaries of the Mississippi River. The low-lying Everglades of Florida also constitute an area where drainage may be utilized effectively. Much of the water applied to lands in the arid and semi-arid regions carries in solution considerable amounts of earthy salts or alkalies. The water which disappears through evaporation leaves behind it salts carried in solution, which may accumulate at such a rate as to cause the soil to become alkaline or "sick," so that crops grown do not thrive. To remedy this situation, an excess of water considerably greater than that of the theoretical needs for plants must be used to wash out and keep moving the salts in solution. This excess water must be drained off the cultivated fields by carefully constructed drains.[15]

There is considerable evidence that prehistoric cities were abandoned because of the accumulation of salts in farm fields. Apparently the failure or inability to provide drainage for the irrigated land on which the towns and cities depended was the cause of abandonment in many cases.

Extent of Drainage. The amount of land on which drainage is used is almost four times the irrigated area of the nation. These lands have been drained at an average cost of about a fifth as much per acre as irrigated lands.[16] Two-thirds of the land in drainage enterprises is located in the glaciated portions of northwestern Ohio, northern Indiana and Illinois, southern Michigan, and north-central Iowa and Minnesota. The glacial deposits obstructed many former stream courses, forming numerous shallow lakes, marshes, and swamps. Most of the other third is in the bottom lands of the Mississippi River and its tributaries, in the Everglades of southern Florida, and in the irrigated districts of the West (see Figure 34).

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[15] In the Salt River Valley of Arizona, and on the lands in Southern California near the Salton Sea, it is estimated that each year there are brought to the fields by canal systems deriving waters from the Colorado River and its tributaries upwards of 2 tons of salt per acre (see Newell, *op. cit.*, p. 171.)

[16] The 1940 Census reports 21,003,739 acres irrigated compared with 79,833,096 acres drained. The average capital invested in drainage enterprises is approximately $8 per acre, while the average for irrigation enterprises is about $45 per acre. (See *1940 Census of Drainage of Agricultural Lands*, Government Printing Office, Washington, D. C., 1942, p. 1; and *1940 Census of Irrigation of Agricultural Lands*, Government Printing Office, Washington, D. C., 1942, p. 8.)

More than 75 million acres in 38 states of the United States are provided with drainage sufficient for normal crops. Nearly 5 million additional acres are partly drained. A total of 87 million acres is included in nearly 40,000 organized drainage enterprises, of which 7 million acres are unfit to raise any crop because of lack of drainage.

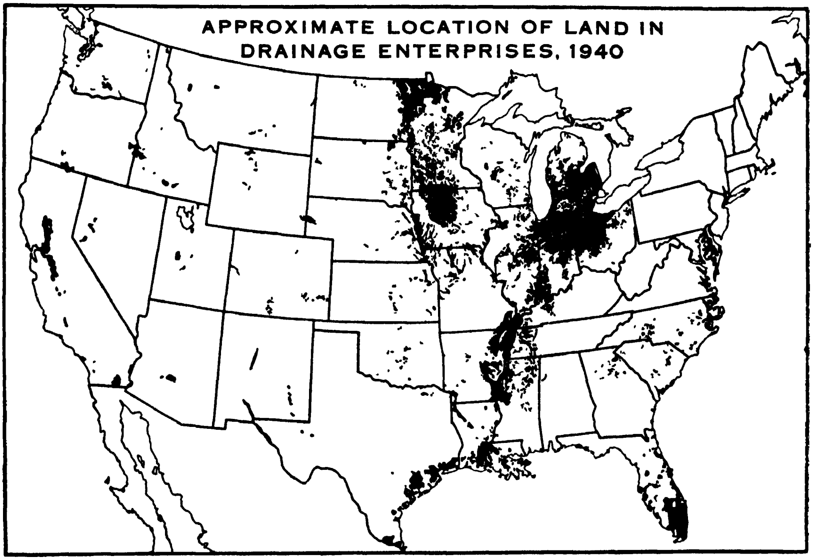

FIGURE 34. Land in Drainage Enterprises in the United States, 1940. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

Drained lands in the United States extend through the heart of the hay and dairy region, the corn belt, and the cotton belt. Corn leads all other crops on drained lands, with an estimated 60 per cent of the total acreage. Wheat ranks second with about a sixth of the total, cotton third with 6 per cent, and hay fourth with slightly less than cotton.[17] Thus, drained lands, to a greater extent than irrigated lands, are devoted largely to standard farm crops rather than to special products that have peculiarly advantageous market situations.

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[17] Estimated proportions of the total drained acreage devoted to different crops are taken from Teele, *op. cit.*, p. 49.

Federal Drainage Policies. The federal government has followed actively a policy of encouraging swamp land reclamation for many years. Its earliest effort was the passage of the *Swamp Land Act* of 1849. This act granted to Louisiana all swamps or overflowed lands unfit for cultivation, and the policy was made general in an act passed September 28, 1850. These acts provided that the proceeds to be secured from the ceded lands should be applied, as far as necessary, exclusively to the purpose of reclaiming these lands by means of levees and drains. An act approved March 12, 1860, provided that no land disposed of by the United States was to be included in the swamp land grants, and that the period for making selections of swamp lands in all states was to be limited to two years. All federal legislation in connection with swamp lands passed since 1860 has been to settle questions arising from shortcomings of statutes by which the grants were made, rather than to extend the scope of these grants.[18] Since the Civil War, the amount of swamp land annually selected has gradually declined, until today only a few acres are patented yearly. However, the total acreage of swamp land patented to the states has far exceeded the modest limits originally planned by the federal government, largely because of liberal interpretation and fraudulent administration of the law. The total swamp land acreage patented amounts to some 64 million acres, while the total covered by claims reported under the swamp land grants exceeds 83 million. Time and again, it was found on examination that three-fourths of the land claimed was not swampy or subject to serious overflow. Hibbard concludes that the reasons for the large patents under the swamp land acts lie partly in the liberal construction placed upon the somewhat indefinite terms of the acts, but more largely "in the persistent and extensive frauds perpetrated in the administration of the law."[19]

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[18] In 1866, measures were passed to "quiet land titles in California"; in 1872, "to quiet certain land titles in the State of Missouri"; and in 1874, 1875, and 1877, further laws were passed for the benefit of Missouri supplementing these statutes as interpreted and enforced by the Land Office. Numerous bills have since been introduced in Congress proposing to quiet swamp land titles, but Congress has tended, in general, to discourage any further legislation, on the grounds that existing laws are adequate to guide executive officers in deciding claims. According to Hibbard, this stand has been effective in preventing any increase in the potential source of conflicts. (B. H. Hibbard, *A History of the Public Land Policies,* Macmillan, 1924, p. 272.)

The acts did not stipulate that the improvement or reclamation of the lands was a necessary condition for the acquiring of title to lands by the states. In a few states, plans of some sort were made by which funds derived from sale of swamp lands should be devoted to the fulfillment of the purposes intended. However, these proceeds were later deflected to other uses until the funds expended in drainage became too small for effective work.[20] Thus, the federal government's effort to bring about reclamation of swamp lands through state construction of levees and drains in return for title to these lands was very disappointing. Since the beginning of the present century, various proposals have been advanced in Congress for the federal government to take an active part in reclaiming swamp lands through construction of drainage enterprises, but so far they have been unsuccessful.

State Drainage Policies. In general, the states have made swamp lands and wet lands pay for their own reclamation. The means used for accomplishing this have been adoption of legislation authorizing drainage districts with power to incur indebtedness and assess benefited lands in order to meet construction and maintenance costs of levees and drains. The first states to pass such legislation were Michigan and Ohio in 1847, and more than three-fourths of the states now have statutes authorizing establishment of drainage enterprises.

Drainage laws of the various states differ considerably, but there are two main types of organization: (1) the *corporate*, which is organized by landowners under public supervision, and (2) the *county drain*, established and constructed like any other local improvement, and managed by county officials. About 95 per cent of organized drainage enterprises are included in drainage districts and county drains, and the cost of drainage is thus almost universally met by assessments against the lands benefited. Ordinarily, state laws provide that districts may be organized only when benefits will exceed costs. Both costs and benefits are estimated, of course, and there is a tendency to underestimate costs and overestimate benefits. However, benefits of drainage enterprises have generally exceeded costs, and defaults on payments are not numerous. The cost of draining swamp land is ordinarily only a fraction as large as the cost of providing a water supply for irrigation, and it is much less difficult for landowners to meet drainage district assessments than to meet assessments in irrigation districts.

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[19] *Ibid.*, pp. 274-287.

[20] For a more detailed analysis of the disposition of swamp lands, see *ibid.*, pp. 281-287. Hibbard indicates that open fraud was practiced not only in the selection of these lands but in their disposition, citing cases where the land was sold by the county commissioners to themselves for nominal considerations or, in some instances, where states bargained with an emigration company, selling the land to the company for 25 to 75 cents an acre with the provision that the company was to put settlers on the land.

Major Drainage Problems. Where wet lands are flooded by water of interstate origin, there is a definite need for a clarification and unification of national and state policies. One of the first needs in this connection is the classification of projects in which waters of interstate origin are involved.

Drainage for the prevention of malaria is an important aspect of national drainage policy. The transmission of malaria has been traced to night-biting mosquitoes whose breeding habits have been learned; and the methods of preventing reproduction of the mosquito are largely through drainage, combined with house-screening and medical elimination of the acute disease from infected persons who are carriers. In areas where malaria is prevalent, largely in the southern states, drainage must follow a special technique, and usually must supplement drainage for land reclamation.[21] Drainage for reduction of pest varieties of mosquitoes not involving public health considerations also requires a special technique. Ordinarily, only very shallow lowering of the ground water horizon is necessary or economically justifiable. The preservation of area values for wildlife refuge and breeding is in many cases a major economic and esthetic consideration too often overlooked. Some of the areas already drained were formerly very fine wildlife refuges and breeding grounds. Their present agricultural use is insignificant, in comparison with their value in their natural state.

Future Drainage Development. It has been estimated that nearly 114 million acres in the United States need drainage to be satisfactory for agricultural use.[22] However, this does not mean that drainage of this entire acreage is economically feasible. Most of the acreage unfit for cultivation without drainage lies in the corn belt and the cotton belt, the latter having about two-thirds of the total acreage. The drained lands of the southern, Atlantic, and Gulf states have been devoted largely to producing corn, cotton, and truck crops, but many other products have been grown on these lands. Whether many or few of the lands needing drainage will be drained in the immediate future will depend largely upon the same economic, physical, and political factors which determine future irrigation development. However, there have been less public undertaking and assistance of drainage than of irrigation, although much the same questions of public policy are involved.

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[21] National Resources Planning Board, *Report to the President,* p. 341.

[22] The 1920 census estimated the total acreage in need of community drainage, both within and outside the boundaries of organized drainage enterprises, to be 113,537,000 acres.

It is undoubtedly true in the case of drainage, as in the case of, irrigation projects, that the more easily developed and less expensive projects have been undertaken first, so that future costs of land reclamation through drainage will be greater. It is estimated that a third of the drainable wet land may be drained at an average cost of $30 an acre,[23] compared with an average of about $8 per acre for lands already drained. Total cost to the individual owner, however, will be increased by the cost of clearing the land of trees and related necessary improvements. It has been estimated that about ⅔ of the area yet to be drained requires clearing of trees, stumps, and brush. Careful consideration of the proposed areas to be drained should be made before drainage work is undertaken, and those projects should be developed first which can be used to produce specialty products for which satisfactory markets are available and which do not interfere with present important uses such as wildlife refuges, rather than for bringing into production those lands which will be devoted to producing crops of which there is a threatened or actual surplus.

In periods of expanding domestic and foreign markets for agricultural products, new lands can be brought into production through drainage enterprises without creating any serious economic difficulties; but in periods of distressing agricultural surpluses and widespread unemployment, expanding agricultural acreage through reclamation by drainage can be justified only if national policy dictates that the impacts of unemployment and lack of alternative opportunities in industry can be met best by furnishing farm operating units for the unemployed or stranded families. The same considerations apply to future irrigation policies. Both irrigation and drainage are means of increasing the productive agricultural area by reclaiming lands not suitable for crop production in their normal state, or unable to produce the amount and types of crops which they can produce through irrigation or drainage.

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[23] George J. Miller, "Reclamation of Wet and Overflow Lands," in A. E. Parkins, and J. R. Whitaker (ed.), *Our Natural Resources and their Conservation, Wiley,* 1936, p. 175.

It is significant that ⅔ of the acreage needing drainage is in the cotton belt. The United States has had a depressing surplus condition in cotton for many years, particularly the types grown in the Old South, where most of the drainable wet lands are situated. The light, sandy soils of this area are well adapted to the production of truck and small fruit, and the important economic factor determining the acreage of land that can be profitably brought into production through drainage enterprises is the availability of good markets for the products. In Florida and along the Gulf Coast, much of the drainable land could be used for growing citrus fruits, and in Louisiana and adjacent areas, much of the land needing drainage could also be used for growing sugar cane. The undrained lands of the Lake states and upper Mississippi Valley could be devoted largely to grain, hay, vegetables, and truck crops, although some of it is adapted to the growing of sugar beets.

FLOOD CONTROL

Man is interested in water because of its destructive as well as its beneficial aspects. No year passes without floods, some of them very serious, somewhere in the United States. The aggregate direct damages caused by floods have been estimated roughly at 35 million dollars yearly,[24] and in some years this amount is greatly increased by the occurrence of widespread floods, such as the Mississippi River flood of 1927.[25] In addition to these direct damages, there are indirect and intangible losses for which no allowance is commonly made, and which are far more widespread.

Causes of Floods. It is generally conceded that flood losses, both direct and indirect, have been increased greatly by unwise encroachment of settlement and industry upon lowlands subject to inundation, and the denuding of forest areas in the upper reaches of drainage basins. Floods have occurred for many years, however, and it is not correct to imply that floods in many areas in recent years are due entirely to human occupance and exploitation of natural vegetation, including forests. Evidences of great floods in certain areas like the Mississippi Valley, prior to the time these areas were settled, are available to show that floods have occurred through strictly natural forces. It is obvious, of course, that the damage done by floods is much greater after settlement, if for no other reason than the fact that human life and property were not there until after man had settled on these lands. In many areas, however, man has by his use of the land destroyed the natural cover and increased the possibilities of soil erosion and flood damage.

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[24] National Resources Planning Board, *Report to the President*, p. 325.

[25] In the 1927 Mississippi River flood, it is estimated that 250 people lost their lives, 700,000 were driven from their homes, and property and crops valued at hundreds of millions of dollars were destroyed. The Red Cross alone spent $17,000,000 in rescue and rehabilitation work. (See Van Hise and Havemeyer, *op. cit.*, p. 126.)

Control of Floods. In many areas, improved land use and soil conservation practices in agricultural and forest land use are sufficient, if followed generally, to reduce floods and erosion to a minimum, but in others special measures and structures are necessary. Flood control structures are of four general types: (1) storage reservoirs to impound flood waters for release at a later time; (2) retarding basins which automatically retard and smooth out flood peaks; (3) channel improvements designed to increase capacity or facilitate stream flow; (4) levees to protect the bottom lands behind them from the overflow waters of the rivers. In general, storage reservoirs are most satisfactory, particularly if the impounded waters can be put to multiple uses, as in the Boulder Dam project on the Colorado River. The best example of complete protection involving the use of retarding basins is found in the Miami Conservancy District of Ohio.[26] Channel improvements are seldom an adequate protection by themselves, but combined with other means of flood control, they are an important contributing control factor.

The use of levees is the traditional method of controlling floods. Use of levees has many advantages, although a policy of "levees only" is not always adequate to control flood waters. Levees are a direct and very visible form of protection which serve as a standing warning against the occupation and use of the part of the flood channel that remains exposed, but they are not always enough. To confine a river like the Mississippi, which normally spreads over 50 miles of flood plain, between dikes only a mile or more apart, simply "sets the river on edge." Moreover, the cost of building levees so high and so strong that they would be entirely safe would be so enormous that the results might not justify the expense. Rivers like the Mississippi, which carry large amounts of soil, are continually building up their stream beds so that they tend to become higher than the surrounding land, making it increasingly difficult and expensive to hold the water in check by levees. In addition, during the years required to carry out such a gigantic scheme, the annually recurring breaks in the completed system would be even more destructive than in the past. There may also be a physical limit to the height to which the walls or dikes can be built, because the delta soil, as in the case of the Mississippi River, may not be able to support the weight of high earth structures, especially on the wet grounds of old sloughs and lake beds.

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[26] National Resources Planning Board, *Report to the President*, p. 325.

Most critics agree that there is no one entirely effective means of controlling floods, but rather a combination of activities and methods which may tend to keep dangerous flood waters in check. An important method is to use practices which will tend to prevent floods from occurring, rather than merely to construct mechanical and other devices, like levees, to hold the flood waters in check. The prevention of floods involves headwater control. Construction of dams or reservoirs to catch and temporarily hold the waters at the head of the streams and their tributaries is the only effective way of preventing floods. By this means, the waters can be gradually released so as not to flood the lands and cities below. The failure of these dams to hold, as in the case of the Johnstown and Conemaugh rivers in Pennsylvania on May 31, 1889, results in very serious damages.

Forests at the headwaters of streams are important in controlling floods. The natural forest cover of litter and humus has great absorption and percolating capacity, which mechanically retards the rate of runoff of water, and thus slows down the stream flow. The removal of standing timber alone, however, has only moderate, if any, unfavorable influence on the absorption and percolating capacity of the underlying humus and soils and on the mechanical retardation of runoff; but the related conditions which have been associated with lumbering operations—such as completely clearing the forest area and cultivating the soil, forest fires which have devastated cut-over land, etc.—destroy the underlying humus and vegetative cover, which does have a significant effect upon the absorption capacity and mechanical retardation of runoff. Conservationists urge that forests be protected and extended not only throughout the headwaters of streams but, where practical, all along the watercourses, particularly in the lower areas where great uninhabited sections are needed to retain the flood waters temporarily.[27]

Flood Control Policies for the Future. The federal government has taken a very active part in flood control activities ever since the disastrous 1927 Mississippi River flood. Prior to that time, all federal funds for flood control work had to be matched by local contributions; but since 1927, Congress has decided that the federal government should bear the entire expense of new flood control projects so that today flood control is practically on the same basis as irrigation. This policy of the federal government in taking over the responsibility for flood control work has created some rivalry for appropriations for other water use programs, including irrigation and navigation, and "rivers and harbors."

The responsibility for flood control is now definitely established as that of the nation as a whole; but much additional research needs to be done on the relative merits and effectiveness of various control devices. Much study is also needed to establish standards which can be used to appraise the merits of particular projects, the uses to be served, the costs, the benefits, and the manner in which flood control projects may be organized and maintained in order to serve the public interest most effectively. In addition to the technical problems of constructing proper devices, the problem of calculating benefits and contributions to meet the costs of such construction is an important problem.

If other meritorious uses can be combined with flood control, they not only help defray expenses, but assist in utilizing the water most efficiently. In many instances, it is feasible to combine irrigation development with flood control; the two frequently supplement each other effectively. The same can also be said in many instances for combining navigation with flood control, or even of combining navigation and irrigation with flood control. The danger of such a combination, however, is that the most beneficial uses of the water may not necessarily receive proper consideration. For example, use of water for irrigation purposes might be the highest use, but stressing navigation or flood control in order to secure appropriations (or for other reasons) might cause undue emphasis upon these uses, to the detriment of irrigation development. The feasibility of combining power development with flood control has been questioned by many on the grounds that to control floods, reservoirs should be empty when floods start, in order to hold back as much water as possible, whereas power dams must be kept filled to provide continuous flow of water for generation of power. However, the two purposes can be combined effectively by providing additional height above the part of the dam used for power, to make for effective flood control.[28] Thus, where wise planning occurs prior to construction, these collateral uses can be combined in many instances in ways which will greatly increase benefits to the general public and simultaneously reduce the net cost of flood control.

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[27] H. S. Person *et al.*, "Little Waters," Soil Conservation Service, Resettlement Administration, November 1935, pp. 25–26.

WATER POWER

Water power furnishes less than 7 per cent of the total mechanical energy used in the United States. However, water power generates over a third of all electricity generated in the nation, and increasing use of electricity with advancing technology makes power production a very important use of water resources. Water power as a source of energy differs from the mineral fuels in that it is not reduced by use. Water power is wasted if it is not used; consequently, to use it is to conserve it. The power of falling water in streams continues to be available indefinitely for human service.

Developed and Potential Water Power. Total stream energy depends upon how much water flows in a stream and how far it falls in its source. Some idea of the geographical distribution of the water resources of a nation can be secured by comparing the topographic map with a rainfall and drainage map. In the United States, for example, the Pacific Northwest, with its mountain ranges and heavy precipitation, has large water-power resources. Total installed capacity of water wheels and electric generating plants in the United States is over 10 million kilowatts, and the annual output approaches 50 billion kilowatt hours. The capacity of water wheels installed in all water-power plants has practically doubled in the two decades from 1920 to 1940.

The estimated total potential annual output of water power in the

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[28] The Norris Dam in the Tennessee Valley has 137 feet of water for power purposes, and an additional 79 feet for impounding flood water before it flows over the dam.

United States is slightly over 500 billion kilowatt hours, according to the Federal Power Commission, or 10 times current output. In other words, the remaining undeveloped power resources are estimated to be about 450 billion kilowatt hours, but only about 273 billion kilowatt hours of this amount, or approximately 60 per cent of the total theoretical undeveloped output, are estimated to be in feasible undeveloped water-power sites. Thus, feasible undeveloped water-power sites are estimated to be capable of producing nearly six times as much energy as those now developed, but only a little more than twice the energy produced by fuel and water combined.[29]

The figures on feasible undeveloped water power do not include many flood control and irrigation dam sites which, in the course of their development, may produce a considerable amount of water power incident to the other purposes for which the development was undertaken. This may bring many additional sites into the field of economic feasibility and increase the estimates of potential water power. Technological developments such as long distance transmission of electrical energy may also increase the amount of water power that is feasible for development.

Water-Power Resource Problems. Production of power from streams must be handled with proper regard for the other important purposes of control of water resources, such as flood control, navigation, soil conservation, water supply, pollution abatement, irrigation, and other special uses of water. Not all of these problems are found in every stream, but two or more are likely to be found in minor streams, and most or all are likely to occur in the great rivers. In this group of water problems, there is both complement of purpose and conflict of purpose. For example, water storage in rainy seasons for release in drier seasons may reduce destruction by flood, increase power, maintain depth of water for navigation, assure continuity of public and industrial water supply, and, by limiting the relative pollution of streams in dry seasons, maintain a better quality of water. In contrast, use of too much of the possible water storage space to facilitate continuous deepwater navigation or to increase the acreage irrigated will leave an insufficient storage for control of floods. The major problem of water resources for water-power production is to fit this use in with these other complementary and conflicting uses in such a way as to maximize the total benefits to the public.

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[29] National Resources Committee, "Energy Resources and National Policy," Government Printing Office, 1939.

The most obvious and most debated conflict of purpose in the use of water resources deals with flood control and power, as mentioned in the section on flood control. Even in the case of use of water resources for irrigation, there may be serious conflicts with the use of the same waters for water power. It would not seem possible that there would be any conflict of purpose in running public water supply, irrigation water, or navigation water through a turbine during periods of release from storage, but if the demands for these uses are so great that most of the water is used, there will be too little left in storage for development of water power later in the season. The only effective way by which these conflicting uses can be handled adequately in the public interest is on the multiple-purpose plan, in which due allowance is made for the various uses of the water resources, including production of power.

Three examples of successful operation of storage facilities to produce the multiple benefits for which they were designed are the Hudson River Regulating District, which is an agency of the State of New York; the Tennessee Valley Authority, which administers the over-all water utilization, control, and development program in the Tennessee River Basin; and the Boulder Canyon project of the U. S. Bureau of Reclamation.[30]

Future Water-Power Development. Only a little more than a tenth of the estimated potential electrical energy that can be developed by water power on the earth has been developed. In the case of the United States, production is only about a sixth of the total energy that can be produced on feasible undeveloped water-power sites. This potential water power is located principally in the Northwest and around the Great Lakes, and on streams which flow into the North Atlantic along the Appalachian range. An active policy of public development of water power is highly desirable, since it would contribute to the attainment of three major national objectives: (1) conservation of scarce fuel materials like petroleum, natural gas, and the high-grade coals, (2) strengthening of the national economy by making electricity cheaper and more widely available; and (3) strenthening of the nation through assurance of more ample electrical energy in time of war.[31]

Multiple-purpose plans are recommended by the Energy Resources Committee for stream development aimed at several important purposes, including direct or incidental power production, and these multiple-purpose lands should be designed and executed in terms of drainage basins, or major subbasins. The committee also recommends that the federal government have primary authority and responsibility for designing and executing these multiple-purpose drainage basin plans. It also recommends that the design of the power system in any drainage basin development should include, in accordance with the best technology of power transmission, the best practicable interconnection (1) of the several plants within a basin system, (2) with neighboring basin systems within the reach of economic transmission, and (3) with the steam capacity built or acquired to balance capacity.[32]

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[30] For an analysis of each of these three undertakings, see *ibid.*, pp. 310–313.

[31] *Ibid.*, p. 279.

DOMESTIC, MUNICIPAL, AND FOOD USES OF WATER

Use of water resources for domestic and municipal purposes, and for transportation of waste, are the highest uses to which water may be put. In the competition of uses, these two, in the order mentioned, should secure the water to the exclusion of the others if the supply is limited.

Domestic and Municipal Water Supplies. Water can command a higher price or justify a greater expense or cost of production for domestic and municipal consumption than for any other use. There is relatively little conflict over the utilization of water for these purposes, because of the small amount needed; and in most areas of the world, supplies are sufficient to meet these uses. Practically every farm in the United States has its own well or pump, which is the source of its water supply, and in the urban areas, heavy outlays are made to develop safe and adequate municipal water supplies. The declining water table in the Great Plains states and other areas in the United States associated with droughts, heavier consumption and demands accompanying settlement and agricultural uses of the soil, and other conditions have created serious problems of providing adequate water supplies for human, livestock, and related needs.

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[32] The British "grid" system is a network of interconnected transmission lines operated by the central electricity board, and so planned that almost all the generating and distributing interests in the nation can effect a connection. The recommendation of the Energy Resources Committee for the best practicable interconnection of transmission lines is along the same channels as the British "grid" system. (See *ibid.*, pp. 279–280.)

In some cities, the water supply system is operated by the city government itself, whereas in others a private corporation provides water. In any case, water for drinking and domestic purposes in cities is sold at a price which covers the costs of engineering enterprises which must be developed to pipe the water to the homes and to assure a safe and adequate supply. The problems associated with this use of water are largely engineering or technological ones, and are not primarily economic, there being in almost all cases an ample supply of water from one source or another to meet these needs, if the proper construction and facilities can be provided at reasonable cost.

Transportation of Waste. The second most important use of water is the transporting of human and industrial wastes away from human habitations. In many large urban areas, streams or water bodies constitute means of sewage disposal. In recent years, through experimentation and research, treatments have been devised to recover much of the waste materials in sewage; but most modern sewage treatment systems leave a large quantity of fluid which, although harmless, must be disposed of in natural drainage channels.

The problems associated with the use of water for transporting sewage and industrial wastes are primarily those of pollution, or of securing the proper engineering facilities and equipment to purify the sewage or wastes at reasonable costs. In many cases, the utilization of streams for transporting sewage and industrial wastes so pollutes them that they cannot be used as sources of public water supplies, nor for the supporting of fish life, nor for recreational purposes. In many cases, taxpayers find it impossible to assume the expense of complete purification, in spite of the recommendations of state boards of health, sanitary engineers, and others urging the great importance of restrictive measures to prevent unnecessary pollution of streams. In small cities, or where the costs of other governmental services are high, or the average per capita income is relatively low, a compromise between theory and practice will usually be effected whereby the expense of complete purification will not be incurred, but the cheaper means of waste disposal, such as dumping into a nearby stream, will be utilized, with all the possible dangers which such pollution incurs.

Water for Food Production. All bodies of water of any considerable size which have not been polluted or poisoned by sewage, mine drainage, or some form of industrial waste, have some value as producers of fish for food. In recent years, one of the most important efforts of conservationists has been to stress or encourage the increased use of such waters by preventing pollution and by stimulating fish culture. This use is also closely related to the recreational uses of water resources, because fishing is a very important sport or recreational activity in many areas. However, from the engineering and economic standpoint, the most important use of water in the production of food is irrigation and drainage.

The value of the total catch of fishery products in the United States and Alaska exceeds a hundred million dollars annually, and in the canned or manufactured state the value of these products is much greater. Fishery products include clams, oysters, shrimps, crabs, sardines, salmon, cod, and fishes of all kinds. The oceans, bays, gulfs, Great Lakes, and many rivers and smaller streams produce in the aggregate a great variety of sea food, which has an important place in modern commerce.

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CHAPTER TWELVE

TRANSPORTATION

A GOOD or service in a given place may have little or no value; made available at another place, it may be very useful and valuable. From the standpoint of efficiency of operation, the smaller the amount of space in which economic and social activities occur, the less energy and costs necessary to provide place utility. Too much space requires that a large proportion of the population devote its time to getting from one place to another, or to moving goods or materials from one location to another.

Railroads and highways, automobiles and pipelines, telephone and power transmission lines, airways, canals, inland waterways—in short, all means of efficient land, water, and air transportation—are used to overcome the space problem. The automobile industry, whose large expansion in the United States in the twenties was considered a sign of great prosperity, is in reality designed to overcome America's greatest handicap, namely excessive space. Excessive space is even more pronounced in Canada than in the United States. Some nine-tenths of the population of Canada live in a thin strip along the northern boundary of the United States, within 200 miles of the border, the interior portion of Canada being very sparsely settled. This interior is isolated by the great western mountain range which is a barrier to easy penetration from the Pacific. Communication to the Atlantic by way of Hudson Bay is blocked by ice, except for a few weeks of the year, and the St. Lawrence River is closed by ice for nearly nine months each year. Of about 2 billion acres, only about 7 per cent is classed as "occupied." To overcome these obstacles of excessive space, Canada has built many miles of railroads, and ranks fourth in the world in total mileage and first in per capita mileage. Canada has also developed her air transportation as a means of overcoming this weakness in her resource pattern.

No great civilization has ever been built without some well-defined system of transportation. As the standard of living of a people rises, transportation fulfills an increasingly important place.

A high standard of living is one in which a great variety of goods and services are available to the people quickly and at various seasons of the year. Improved transportation facilities are essential to bring a great variety of food products and related goods and services to consumers who may live thousands of miles from the source of these products. Without modern transportation facilities, consumers living in New York City could not be furnished in the winter months with fresh vegetables and fruits grown in warmer climates.

As technology advances, the means of overcoming space are increased both in number and in speed. Modern aviation is a good example of improved transportation facilities resulting from advancing technology. Highway construction must be adapted to provide safe driving for modern high-speed motor vehicles as must also roadbeds for modern streamlined railroads. These changes increase the cost of construction per mile, and require the use of much more land per mile of highway or roadbed than formerly. Many acres are required for expanding airfields to take care of increased airplane transportation. Large union railroad terminal facilities, warehouses, bridges, wharfs, and harbors use a great deal of iron and steel and other mineral resources, as well as a large amount of power resources.

Transportation as a Land Use. From the standpoint of area used, transportation ranks considerably below agriculture and forests, but in terms of wealth in the form of fixed capital, it exceeds them.[1]

Transportation bids high for the services of land, in competition with other uses. Transportation is a higher or more intense land use than agriculture, forestry, or recreation, and it is ordinarily a higher use than urban residence, and frequently than urban industry. Only in the case of very rich ore deposits would a given piece of land be utilized for mining rather than for transportation, if the land were situated in the line of transportation development.

Provision of modern transportation facilities requires the services of millions of people. In the United States alone, it has been estimated that 3 million workers—about 7 per cent of the gainfully employed—are directly engaged in the transportation industry. Millions more, of course, are affected indirectly. The student of land economics should not conclude that density of population is the only remedy for excessive space and consequent heavy transportation expenses, for excessive population density results in heavy transportation expenditures. For example, in New York City, great expense is involved in overcoming the space factor in getting from lower to higher floors of office buildings, apartment houses, and so forth. The concentration of several million people in such a limited area necessitates expensive overhead and underground transportation facilities. Traffic consumes much time and requires policing and regulatory measures. Thus, solution of the problem is not excessive population density, but optimum population density.

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[1] The total wealth involved represents the current value of all transportation equipment facilities, including terminal buildings and repair shops, and all steam and electric railroads, taxis, waterways, drydocks, pipelines, and airways. (R. R. Doane, *The Measurement of American Wealth*, Harper, 1933, p. 15.)

LAND TRANSPORTATION

The most important means of modern transportation is land transportation, which includes railroads, roads, streets, and highways. There are more than 3 million miles of roads in the United States, excluding streets in cities. These roads cover more than 19 million acres. City streets cover some 2 million acres. The railroad is still the nation's and the world's principal means of transportation. Approximately two-thirds of the commercial freight traffic of the United States, measured in ton miles, is carried by rail. The United States has nearly a quarter of a million miles of railroad, or almost a third of the world's total. Some 4 million acres are used by U. S. railroads for rights-of-way, yards, shops, station grounds, and other transportation purposes; and more than nine-tenths of the total U. S. population is served by one or more railroads.[2]

A relatively minor (and usually subsurface) use of land for transportation compared with railroads and highways is that of pipelines, which are used to transport certain types of liquids, especially petroleum and some of its products. Crude oil is carried from production fields to refineries, and gasoline from refineries to distribution centers. Natural gas is also piped from producing wells to great consumption centers such as the Chicago area. There are some 96,000 miles of interstate pipelines and more than 20,000 miles in intrastate pipelines, used for transportation of petroleum and its products, which transport more than a billion barrels of crude oil and its products annually.[3] Pipelines are also used for transportation of sewage and for transporting water to industrial plants and city residences through water mains.

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[2] Association of American Railroads, "Quiz on Railroads and Railroading," Washington, D. C., July 1940.

Factors Determining Use of Land for Transportation. Historically, topography has been one of the major factors determining the location of transportation routes, and most trails, roads, and railroads ran along river valleys, mountain passes, and generally level areas, avoiding mountains and steep hills. In spite of modern technology, the cost of highway construction in mountainous areas, where roadbeds must meet minimum grade requirements for modern sustained speed, is often great enough to compel the use of more level routes.

Aside from topography, natural factors are of minor and usually insignificant importance in determining the transportation route. It is true that some soil characteristics in association with more important factors like strategic location are more desirable than others, but they are not generally so significant as to be the limiting factor. For instance, it may cost more to construct a roadbed in very rocky or clayey soils than in sandy ones, but the difference is a very minor factor in deciding where the road will be built.

Human forces are of major significance in the determination of transportation routes. Land whose principal use is for upholding or supporting strength can hardly be considered as destructible physically through utilization or non-use, and the value of transportation land is acquired through *situs*. Situs has been defined as the "consensus of human choice and convenience, or the quality aspect of situation."[4] Like all economic utilities, situs is a social product created by man collectively, through preference or choice, and this value may be destroyed by the human choice that created it. Improvements on the land, in the form of roadbed preparation and surfacing, are so large that maintenance of the improvement constitutes the major problem of transportation land use. In this respect, transportation land more nearly resembles urban land than any of the other major types; and since characteristics of urban land are discussed at some length in the next chapter, no further analysis will be made here.

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[3] Interstate Commerce Commission, "Statistics of Railways in the United States," Government Printing Office, Washington, D. C., 1938, p. 215.

[4] Dorau, H. B., and Hinman, A. G., *Urban Land Economics*, Macmillan Co., New York, 1928, p. 167.

Early Roads in the United States. The lack of a strong central government with the responsibility and the financial ability to undertake a task as large as the construction and maintenance of a suitable system of roads for internal transportation proved a serious matter in America in the early part of the nineteenth century. Not only did the poor roads interfere greatly with the movement of goods and people within the area, but the cost of transportation over unimproved roads operated like a prohibitive tax.[5]

With developing production and commerce with the western areas, the need for improved roads increased. Local and state governments in some cases undertook road construction and improvement, but for a considerable period the work was undertaken by private companies which charged tolls. The states were poor, and used various means, including lotteries, usually "bridge and turnpike" lotteries, to finance construction of transportation facilities. Turnpike building was gradually turned over to private companies, who were authorized to charge the public for the use of the roads, and the toll system became widespread. However, as travel increased, toll charges were reduced.

Federal Land Grants for Roads. Neither private companies nor local and state governments proved adequate for providing good roads to meet the needs of the nation's rapidly expanding economy accompanying westward settlement, and in 1802 Congress passed an act providing for a donation of 5 per cent of the proceeds from public lands sold in Ohio for building public roads. In 1823, Ohio received a grant of land to construct a highway from the lower rapids of the Miami to the western boundary of the Connecticut Western Reserve. Several wagon road grants to other states followed. The total amount of federal lands granted to states for wagon road purposes was less than 3½ million acres, of which more than three-fourths, or 2½ million acres, were granted to the state of Oregon; about one-sixth of the total was granted to the states of Michigan and Wisconsin; and the balance was given to the states of Indiana and Ohio.

Federal support for road construction was not limited, however, to granting lands to the states. The building of the National Pike was made possible by an allocation to the states of 5 per cent of the sums realized from the sale of public lands in these states. Efforts were also made to secure federal appropriation of money for the construction of roads; but not until more recent years has the federal government, through its Bureau of Public Roads with large federal appropriations, taken active leadership in the construction and maintenance of an adequate highway system.

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[5] At the prices prevailing for wagon traffic in New York state between Albany and Buffalo in 1817–1819, the cost was about 30 cents per mile per ton, or from $100 to $120 per ton for the entire distance. (W. M. Lewis, "The Significance of Transportation to Civilization," *Annals of the American Academy of Political and Social Science,* vol. 187, September 1936, p. 3.)

The United States is perhaps the best example of the importance of a network of well-constructed and improved highways to the economic life of a nation. With its more than 25 million automobiles and nearly 5 million trucks, the necessity for good roads is obvious. The modern highway system of interconnected public roads has been made possible by the policy of federal aid in construction. However, with minor exceptions, federal funds for road construction have been granted to the states only on condition that such construction funds be matched by the states, and that the states assume the entire obligation of maintenance. Through this process, some states have invested vast sums in road building and have borrowed heavily to accomplish this purpose. In some cases, the indebtedness will not be retired until long after the mileage for which the indebtedness was incurred has required rebuilding.

Financing Modern Highways. Many of the states that have the greatest transportation problems—that is, have large areas requiring great mileages of roads for adequate transportation facilities—do not have the taxable wealth or financial ability to support an adequate road system. Gasoline taxes will furnish a considerable portion of the funds required to finance such a program, but some plan must be worked out whereby the nation as a whole contributes in greater amount and more directly to the financing in the sparsely settled states characteristic of the western country, if an adequate system of highways for the nation as a whole is to be constructed and maintained.

Much can be done to reduce road construction and maintenance costs by constructing through highways for heavy traffic and for freight-hauling purposes. This would enable less expensive types of construction to be used on other roads, because they would be relieved of the heavier vehicles. Much can be done also to reduce highway costs by careful planning of the highway system so that only those roads which are used as public highways will be constructed and maintained at public expense. It is estimated that of the 3 million odd miles of roads in the United States, some 70 per cent perform little or no service other than to provide access to land. While this is a very important service, the average annual vehicle mileage per mile on these roads will never justify any high standard of improvement; nevertheless, in some areas some of these have already been surfaced, in many cases with expensive material, when some cheaper form of surfacing would have been adequate. The proper construction and improvement of the remaining 30 per cent of the highways, as differentiated from the land-service roads, constitute the mileage in which all classes of the population are vitally concerned, and even in the case of farmers, the major portion of their own travel mileage is made over these more important highways.[6]

Many argue that if street and highway systems were properly planned and constructed to eliminate traffic congestion at various points in larger metropolitan areas, and to facilitate rapid and economic movement of goods and people from point to point within the nation, increased efficiency from time saved would greatly increase the productiveness of the economy as a whole, and this increased productiveness would help defray the major portion of the costs of financing highways.[7] In addition to these savings—from increased efficiency and elimination of lost time and cost of "stop-and-go" driving—travel would be much safer and the cost of injury and fatal accidents should be considerably less with the improved traffic conditions resulting from the improved highways.

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[6] Roughly, there is one mile of rural road for each square mile of territory in the United States, and this ratio is exceeded only in a few of the old, densely populated countries of Europe. It seems safe to say that only to a very limited extent is there any demand for increase in the extent of our rural road system, or what might be termed "land-service roads." (See C. H. Purcell, "Demands for Highway Transportation and the Need for Improved Items of Safety," *Proceedings of the 35th Annual Conference of the American Roadbuilders' Association, 1938*, National Press Building, Washington, D. C., pp. 40–50.

[7] One writer points out that the average citizen making two trips a day in the average city, with ten stops each way caused by traffic and congestion, could under improved conditions eliminate or save sufficient stops each way—say 5, or a total of $36 per year per automobile. In the Los Angeles metropolitan area, where there are about 1¼ million automobiles registered and operating, this saving would amount to an anticipated total of over $43,000,000 yearly. (See Lynn Atkinson, "Motor Highways or Stagnation—A National Economic and Political Issue," *Proceedings of the 37th Annual Conference of the American Roadbuilders' Association, 1940,* National Press Building, Washington, D. C., p. 172.)

The Problem of Safety on Modern Highways. One of the most important problems which has developed with the increasing use of the automobile and truck in recent years is that of traffic safety. This problem results not only from increased numbers of automobiles and trucks on highways, but from increased speed of modern vehicles. In general, mechanical efficiency and speed of motor vehicles have been greatly increased without corresponding adaptation in construction of highways, either in engineering specifications or financial support and administration. Many roads are not adapted to modern high speeds, and increased accident rates result. In many areas, townships and local county units are still largely responsible for road construction, maintenance, and administration, and do not have the equipment or means of providing types of highways best suited for modern high-speed traffic. Nevertheless, in the last few years, many improvements have been made in engineering construction, including non-skid surfacing, more adequate width of travel lanes, additional travel lanes, grade separation, overpasses, adequate rights of way for proper control of roadside development, removal of dangerous curves, and construction of long-radius curves. Careful elevation, more nearly adequate and longer sight distances, flattening of vertical curves, and other improvements must be developed to assure steady, unobstructed flow of traffic with safety at high speeds. Since transportation can outbid most other major uses for land, and since efficient transportation is so essential in the modern economy, these improvements in major highways will undoubtedly be made more generally as travel increases.

These changes in highway construction and design will require heavy financial outlays and increased use of land for highway transportation. Improvement of highways, combined with a better understanding and appreciation of traffic rules and problems by drivers, should greatly reduce traffic accidents and increase efficiency of highway transportation. Highway transportation in a nation like the United States is so important that reduction of accidents and related wastes is of primary importance to the economy.

In addition to the area used for dividing strips, travel lanes, shoulders, inner slopes, and water courses, which should average about 132 feet for major highways, there should be space for pedestrian walkways, for landscaping, and for related developments. Two rods, or 33 feet, on each side would increase the minimum required area to 198 feet. In other words, 200 feet would be a minimum amount of land for rights-of-way for major highways.[8] This would require about 25 acres of land per mile of highway. The ease or difficulty of acquiring areas adjacent to highways are important factors determining the width of rights-of-way. Where difficulties are not too great, widths up to 300 feet are not excessive.

In the interests of securing increased widths of highways, and to promote safety at intersections, setback ordinances and related legislation are desirable. Roadside improvements help stabilize the roadside against erosion, control snow drifting, and gratify the esthetic sense. It is also essential to have public control of land abutting on the highway right-of-way, as well as control of the right-of-way itself, if development of the lands the roads serve is to be in the best public interest. Land use problems which affect highways are simply the ones that are most conspicuously visible from the highways.

Federal Land Grants for Railroads. Public land grants-in-aid for transportation, which began with wagon road grants in 1823, inaugurated a policy which extended to other types of transportation, including railroads and canal and river improvements. Recognition of the importance of efficient transportation facilities in the westward development of the nation and the advancement of the country as a whole gave rise to vast public land grants for railroad transportation. Undoubtedly, such railroads would eventually have been constructed, but public land grants accelerated the rate of settlement of the nation, increased the value of adjacent government and private lands, and tended to unify the nation. The railroads that received land grants fostered immigration in order to convert their land grants into cash, and to develop tonnage to haul. Large quantities of timber and minerals were found in many sections inaccessible by water.

The first railroad land grant was made on September 20, 1850, and from this time through March 3, 1871, 89 land grants were made, of which seventeen were later forfeited by Congress for failure to carry on the construction work. In the seventy-two unforfeited grants, nearly 153 million acres were involved, of which more than 130 million acres have been patented.[9]

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[8] This recommended 200 feet is divided as follows: Central dividing strip, 30 feet; travel lanes, 4 at 12 feet each, 48 feet; shoulders, 2 at 12 feet each, 24 feet; inner slopes and watercourses, 2 at 15 feet each, 30 feet; space for pedestrian walkways, for landscaping and related developments, 2 rods or 33 feet on each side, 66 feet. (See M. W. Torkelson, "Report of the Problem Committee on Cross-Sections and Roadside Developments," *Proceedings of 35th Annual Conference of the American Roadbuilders' Association, 1940,* National Press Building, Washington, D. C., p. 316.)

Railroad grants were given for the right-of-way of the railroad, and on either side of this strip of territory, alternate sections of land were awarded to defray costs of construction. In many areas, these alternating "construction" sections, referred to as primary grants, had already been disposed of to settlers or reserved for specific purposes under other land laws, or were mineral in character. Consequently, other tracts of land in lieu of the primary grants (alternate sections) were made available to the roads and known as "indemnity grants" or "lieu lands." The amount of land granted varied with different railroads. The grant in 1850 to the Illinois Central and Mobile and Ohio provided for alternate sections for six miles on each side of the road; while in the case of the Northern Pacific grant in 1864, 20 sections per mile on each side of the railroad were granted within all territories traversed, and half that amount within states. In other words, in a territory like Montana, primary grants extended 40 miles on either side of the railroad, and lieu lands might be chosen within ten miles of the outer line of the alternate-section grant, making railroad lands possible for a distance of 50 miles on either side of the railroad line.

In return for lands granted to the railroads, the federal government was given reduced rates for certain types of transportation services rendered it by the land grant railroads. These concessions varied from complete exemption of certain transportation charges to stipulations that certain types of traffic should carry charges fixed by the government or not higher than charges to other shippers. The Supreme Court construed the land grant statutes as not contemplating free transportation service for the government, but only free use by it of these roads in performing its own transportation service. It established 50 per cent of the normal commercial rate as the proper charge to be made by the railroads for transportation services performed by them for the government over land grant lines, based on its findings that 50 per cent of total railroad costs was incident to providing and maintaining roadbed and tracks. Competing roads made the same reduction on government traffic in order to participate in the business. This arrangement affected roads principally in the western district, since no lands to aid in the construction of railroads were granted to any states east of the Mississippi and north of the Ohio River, except Michigan and Illinois. In the South, such land grants were made to the states of Alabama, Mississippi, and Florida.

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[9] See U. S. Department of the Interior, "Transportation," General Land Office, Information Bulletin 5, 1939 series, Washington, D. C., 1940, pp. 3 and 6.

The *Transportation Act* of 1940 made provision for repealing the lower freight rates charged on government traffic by land grant railroads. This repeal of land grant freight rates was contingent upon the settlement of claims against the United States for certain lands in connection with railroad land grants which certain land grant railroads had instituted, and which had been pending in the courts for many years. The Northern Pacific Railroad was the last of the roads to come to a settlement of its claims, all other railroads having previously signed a release of claims to land still in litigation with the government. With final settlement of the Northern Pacific land claims in the early part of 1941, the federal government closed out its early railroad land grants, and more than 8 million acres of land in 11 western states were restored to federal ownership thereby.[10]

Effects of the Freight Rate Structure on Land Use. When economic forces have established a price for a commodity in a central market, the amount received by the individual producer will equal approximately the market price less the costs of transportation. In an area of surplus production, the price is approximately equal to the primary market price minus the costs of moving the product to the market; while in the case of a deficit area the price is roughly equal to that in the most distant area of surplus production from which the supply is secured, plus the cost of transportation and handling.[11] Since agriculture produces over ⅔, measured by cost, of the raw materials used in American industry,[12] freight rate differentials are particularly important to farmers, in determining the agricultural land use pattern. Transportation charges are a cost of production, and like other production costs they must be met by the price paid by consumers if production of the goods and services is to be continued. If the transportation haul is long, so that transportation costs are appreciable, the operator must have certain other conditions of production which make his costs of production relatively low, or otherwise he will not be able to compete with other producers in areas nearer to market, where the transportation costs are appreciably lower. Thus, transportation charges are an important factor determining comparative advantage or disadvantage of various regions in the production of different goods and services.

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[10] Northern Pacific land grant claims were in controversy from the time construction of the road began in 1870 until the claims were settled in April, 1941. The road originally was granted a total of about 39,400,000 acres, and claimed a shortage of 3,700,000 acres due to the classification of lands within the place limits of the grant as mineral lands. In order to make up this deficiency, the road sought land in the indemnity or "lieu" limits specified in connection with the grant. But the government withdrew 2,900,000 acres from the indemnity limits and the railroad contested the right of the government to make this withdrawal as long as there remained a shortage in the grant. Congress in 1929 retained the land but authorized payment of compensation if the railroad claims were found valid in the courts. The lower courts reduced the valid claims from 2,900,000 acres to 1,453,061 acres, and the U. S. Supreme Court upheld this reduction. Under the settlement, effective in 1941, the Northern Pacific relinquished its claim against the United States to compensation for the 1,453,016 acres. (*Railway Age,* vol. 110, no. 17, April 26, 1941, p. 737.)

Competition of low-cost water transportation on through traffic from Atlantic seaboard ports to Pacific coast ports results in lower transportation rates to these points than to inland points where no through competitive rates are effective. The relatively high freight rates to and from points in Rocky Mountain states and in the South are an important obstacle in the industrialization of these areas.

Land values represent in general the capitalized net return to be secured from the lands. The lower the transportation costs, other things being equal, the greater the amount which can be capitalized into land values, and vice versa. As a general rule, therefore, land values are higher in areas close to central markets or located near transportation facilities which provide prompt and cheap transportation to central markets.

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[11] "Prices of Farm Products Received by Producers," U. S. Department of Agriculture, Statistical Bulletin 17, and "Reliability and Adequacy of Farm Price Data," U. S. Department of Agriculture Bulletin 1480, Government Printing Office, 1927.

[12] Agriculture and animal husbandry supplied 67.4 per cent of the total raw materials, based on cost, used in manufactures in 1929. Mining and quarrying supplied 27.6 per cent, logging and related forest enterprises 3.8 per cent, fishing .3 per cent, and hunting and trapping 1.0 per cent. With the increased use of minerals and a developing technology, this proportion may decline somewhat. However, agriculture will always be a very important source of the raw materials used in industry and in the less highly developed industrial areas agriculture will play an even more important part. It is logical to assume that at least for several decades agriculture will produce at least half or more of the raw materials used in American industry. ("Materials Used in Manufactures: 1929," U. S. Department of Commerce, Government Printing Office, 1933, page 4.)

Except where length of haul to market, lower cost of transport, or special service requirements make rail service indispensable, farmers have shifted to motor trucks as a substitute for railroads. About a million motor trucks are now operated by farmers, providing a flexible means of transporting farm products under their own control. Much agricultural traffic also moves to market by means of common and contract motor carriers, with the result that railroads have lost to motor trucks significant proportions of the traffic in fat livestock as well as in fruits, vegetables, dairy and poultry products, baled hay and straw, cotton, sugar beets, and other farm products. It is estimated that railroads now secure less than 3/5 of the total potential traffic of farm animals and their products.[13] Moreover, the impact of probable changes of these shifts in transportation facilities and costs upon interregional competition is of particularly great concern to transcontinental shippers of farm products and to other long-haul shippers.

WATER TRANSPORTATION

The least important use of water, as was pointed out in the preceding chapter, is for navigation. From the standpoint of law, however, navigation has a preferred position, being practically the only use recognized in the Constitution of the United States. In the early days when the Constitution was being considered, about the only safe way of communication between the settlements in the colonies was by water. In spite of modern more speedy and efficient methods of transportation by highways, railways, and skyways, water transportation still plays an important part in the trade and life of communities within nations and between nations.

Water navigation may be divided into five major types: (1) oceanic, (2) transportation on large lakes, gulfs, bays, sounds, or similar bodies of water, (3) coastal, (4) river transportation on large creeks or similar inland streams, and (5) canal. The real importance of these various types varies considerably in different parts of the world. In the case of the United States, each of these types of navigation is important, but on the basis of volume of traffic, oceanic freight and passenger lines are most important, with the Great Lakes second.

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[13] Cf. R. L. Dewey, and J. C. Nelson, "The Transportation Problem of Agriculture," U. S. Department of Agriculture *Yearbook*, 1940, p. 728.

Early Navigation. Transportation by water has been a means of moving goods and people from place to place from time immemorial. The Egyptians, as early as 2000 B.C., were building vessels larger than those in which Columbus sailed to the New World. Rome depended so much upon wheat imports that the Empire subsidized the merchant marine.

Navigation was largely a matter of utilizing water near shores for a long time, and navigation techniques were extremely crude, involving a considerable amount of guessing. Classic example is that of Columbus, who, in searching for a route to the East Indies, discovered America. Early navigation used the galley system (human muscles) and sails (the galley system when the wind failed). The wind was an important factor in determining transportation dates, ports, and routes. Arabian and Phoenician merchants kept close to the shore line all the way to Calcutta until they discovered the regularity of the monsoon winds, which would blow them directly across the Indian Ocean to the desired Malabar Coast in about half the days the shore route required.

Early navigation was slow. Seasonal winds required a certain amount of waiting, and the ships themselves were slow. Protection of sea lanes after the Egyptian period was only sporadic. On inland waters, tolls flourished and ports were largely natural. A fairly good canal system had been developed by the Egyptians near the present Suez Canal, and during the Middle Ages the Italians invented the lock system for canals.

Federal Land Grants for Canals and River Improvements. Similar to its policy of granting lands in aid of wagon road and railroad construction were the federal government's grants for canal and river improvements. On March 2, 1827, lands were granted to Indiana and Ohio for the construction of a canal on the Wabash River to Lake Erie; and from that time until 1866, nine other grants were made to various states for canal construction and improvement. In these ten grants, a total of four and a half million acres was granted.[14]

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[14] These canal grants were made to the states of Indiana, Ohio, Illinois, Michigan, and Wisconsin, during the period 1827–1866, and totaled 4,597,678.22 acres, the largest grant being the first one (in 1827) for construction

The federal government made four main grants for river improvements, Alabama being awarded land on May 22, 1828, Wisconsin in 1846, and Iowa in 1846 and 1862. River improvement grants totaled approximately 2¼ million acres.[15]

Oceanic Navigation. Oceanic navigation is concerned with foreign commerce (exports and imports). Total water-borne foreign trade for the United States has averaged between 70 and 100 million long tons (2240 pounds) in recent years, and in terms of dollars, has averaged between 5 and 6 billion dollars annually, or about 7 per cent of the total national income. This foreign commerce is handled largely through a few ports, the principal one of which is New York City. The quantity handled is governed largely by depth and safety of the harbors, handling facilities, communications, and nearness to large centers of population and industry.

Ocean transportation is much less expensive than transportation on land, largely because the right-of-way on the ocean is usable in its natural state. There are no construction costs, no taxes, no maintenance or upkeep. In areas where the use of water for transportation necessitates certain expenditures such as surveying, dredging, lighting, etc., as in restricted bays, rivers, or canals, the expenses are much higher; but even under these conditions water transport is ordinarily much less expensive than land transport.

In addition to the fact that the ocean is a free highway, water transportation is cheaper because the capital invested in the carrier is less per ton of freight than in any form of land transportation. Terminal charges, labor, insurance, and power used per unit of freight volume and weight are also less.

Great Lakes Transportation. The Great Lakes are the most important group of inland waterways in the world. They are international in character, since both Canada and the United States utilize them for transportation. The channels between the lakes were originally only a few feet in depth, and could be navigated only by small vessels, but these channels have been increased in depth in recent years so that freighters of large capacity (some drawing as much as 25 feet of water) can be successfully operated. With development of the proposed St. Lawrence-Great Lakes Waterway, it is

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of the Wabash and Erie Canal to the state of Indiana, totaling 1,480,418.77 acres. (U. S. Department of Interior, "Transportation," p. 4.)

[15] The total number of acres certified or patented in satisfaction of river improvement grants was 2,245,334.25 acres.

possible that the Great Lakes may be used by ocean-going vessels. Movement of freight on the Lakes is largely eastbound, and more than half of the total tonnage consists of iron ore from the Lake Superior region to Ohio ports where it is transshipped to Pittsburgh and other iron-manufacturing centers. Westbound freight consists largely of coal taken to the head of the Great Lakes for distribution to the interior. About four-fifths of the total ton mileage of freight carried on the inland waterways of the United States is transported over the Great Lakes.

The use of the Great Lakes for transportation has developed complications through competition of other uses for these waters. Increasing the depth of the connecting channels between the lakes reduces the height of the water and makes efficient transportation more difficult. The city of Chicago, which has been diverting upwards of 10,000 cubic feet per second from Lake Michigan and turning it into the headwaters of the Illinois River, has caused an additional permanent lowering of the lake level. During years of extreme drought, the annual losses to shipping interests are said to be several hundred thousand dollars for every inch of decrease in height of water, so that reduction of the lake levels by such diversion is an important economic factor influencing the efficiency of the Great Lakes for transportation. These and other losses have resulted in controversies between Illinois and other states and in the prosecution of suits in the United States Supreme Court. The most important point established is that the United States has full jurisdiction over the use of waters of the Great Lakes by American interests, and may prevent the sanitary district of Chicago from diverting water. At the same time, Canada has set up claims of interference with its riparian rights, and has brought pressure through diplomatic channels, bringing up important international as well as interstate relations.[16]

Coastwise Transportation. The coastwise trade of any country that has a long coast line is of great importance. Coastwise traffic is slow, but so cheap compared with land routes that a nation that can take advantage of a large amount of coastwise traffic has an important economic advantage over one that cannot. The United States has a large coast line on two great oceans, in addition to a considerable coast line on the Gulf of Mexico, and its coastwise traffic is of tremendous importance not only in total volume of trade involved but in reducing rates on land transportation in many parts of the country.

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[16] For a more detailed analysis of Great Lakes transportation, see F. H. Newell, "Water," in Van Hise and Havemeyer (ed.), *Conservation of Our Natural Resources*, Part II.

The Panama Canal has made United States trade between the Atlantic and Pacific coasts so cheap that the transcontinental railroads have felt the competition keenly. The Interstate Commerce Commission has allowed the railroads to quote rates for a through haul from coast to coast lower than those for much shorter distances between inland points. The freight rate schedules for the United States resulting from the competition of low-cost coastwise water transportation, as has been noted earlier, is an important factor determining the location of industries and land utilization patterns for the nation as a whole.

Coastwise traffic is carried on with smaller vessels, and does not tend to concentrate in a few large ports, like ocean shipping. The availability of low-cost coastal transportation can be extended in many areas by the construction of canals connecting coastal waters. For example, in the United States, one of the largest enterprises under consideration and on which active construction has already been undertaken in part is connecting such coastal waterways as Long Island Sound, Delaware Bay, Chesapeake Bay, and the almost innumerable inlets and passages fringing the Atlantic Coast, by canals built paralleling the coast and behind the outer fringe of natural barriers. This waterway would begin on the north with the Cape Cod canal connecting Massachusetts Bay with Buzzard's Bay, then extend across New Jersey to Delaware Bay, across the low-lying portion of Maryland to the Chesapeake Bay, to the vicinity of Norfolk, through the swamp area into the various sounds cutting across Wilmington, North Carolina, into the Cape Fear River, and on south indefinitely, possibly across Florida and connecting up with the fringing waterways to Mobile, New Orleans, and through Texas to Brownsville.[17]

Inland Waterways—Rivers and Inland Streams. Transportation on inland waterways differs significantly from ocean transport or transportation on such large inland bodies of water as the Great Lakes. In the first place, the rights-of-way for inland waterways are often not "free." Most inland waterways require some dredging, straightening, and lighting before they can be used most effectively, and many require the construction of canals with locks and similar expensive equipment. However, in many cases these costs are not recovered through the freight charges, as is often the case with railroads or highways, but are borne by the government, thereby enabling inland waterway transportation rates to be comparatively low.

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[17] This enterprise involves hundreds of millions of dollars, but it has already been entered upon at various points. It is planned to provide a navigable depth of 9 feet, maintaining this depth up the Mississippi and Ohio Rivers. Such a plan of canal development paralleling the coast would have tremendous significance to the areas adjacent to such canals and such coastal waterways. (*Ibid.*, p. 210.)

Transportation on inland waterways has several important disadvantages, compared with overland routes, which tend to offset their lower freight rates. In the first place, transportation on inland waterways is slower than most forms of land transportation, and many waterways are too small to admit large ships, so that the economy of power which is used in proportion to cargo is reduced. Moreover, the use of large ships on restricted inland waterways with narrow channels increases the danger of collision or grounding. But the outstanding handicap of inland waterways is that they are relatively fixed in direction, while overland routes are much more adaptable to changes in location of freight.[18]

In spite of the limitations of inland waterways and the frequently appreciable costs involved in making them usable for transportation, they play or have played a rather important role in the opening up of new regions for land settlement and development in many areas. Small boats can frequently navigate unimproved waterways, if certain precautions are used, and this type of transportation in areas like the Amazon Valley, or the Mississippi Valley before the Civil War, is far cheaper than building roads or railroads. In this way, inland waterways play important parts, particularly in the pioneer stages of land settlement and development.

There are some 300 rivers in the United States which are being used or could be used for commercial purposes, with an aggregate length of navigable water of upwards of 30,000 miles. Most of these rivers can be navigated only by light craft; possibly not over a tenth of the mileage is at present available for craft requiring a depth of over 9 feet, and another tenth may be utilized by boats drawing 6 feet of water. The greater portion of the mileage, however, can be used, if at all, only by very shallow barges, flatboats, or timber rafts.[19]

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[18] L. E., Klimm, O. P. Starkey, and N. F. Hall, *Introductory Economic Geography,* Harcourt, Brace, 1937, p. 275.

The Mississippi River is the longest navigable river in the United States, having about 2500 miles of navigable water with a depth of 6 feet or more. In the pioneer days, traffic on this waterway was extremely important, but with the development of the railroad and modern highways and skyways, it has declined in significance. In recent years, the development of flood control projects on important tributaries of the Mississippi, and the development of plans of interconnection of the rivers of the nation may increase the use of the Mississippi for transportation purposes.

Canals. In the United States, over 4500 miles of canals were built, largely before the days of the railroads, and of these over half have been abandoned. Today, few canals are in active use, and even those which are being used, with the exception of the artificial waterways connecting the Great Lakes and those which may form part of the great system of intercoastal passages, are of doubtful economic importance, since the services which they perform could be rendered by the railroads or by other means of transportation at possibly less cost.[20] Some canals are icebound during the winter, and all are subject to unfavorable conditions of low water caused by drought, or dangerous water caused by floods. Few canals have been provided with proper freight terminals, and all are maintained at public expense, directly or indirectly. The most notable canal in the United States now in operation is the New York Barge Canal, built by the State of New York at a cost of some 170 million dollars. However, the tonnage carried on this canal is only a very small fraction of that carried on the New York Central Railroad, which approximately parallels it.

In the old days, when navigation had practically no competitor in transporting passengers and goods, it was the surest and often the quickest way of getting from place to place, and involved the least discomfort; but the revolution brought about by steam and the steam engine and the greater flexibility possible in reaching distant points by highways, railroads, and skyways has brought about a gradual abandonment of inland waterways in favor of these more modern transportation methods. In order to utilize what might be cheap water transportation, however, it is necessary to have a highly developed system by which freight may be brought by rail or truck to the boat, and in turn removed from the boat and distributed by rail or truck throughout the city or nation. To do this requires coordination and cooperation between railroad and water carriers which, although theoretically possible, involves many practical difficulties.

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[19] Newell, *op. cit.*, p. 211.

[20] *Ibid.*, pp. 211–212.

Development and use of canals has been more extensive and effective in Europe than in the United States. The industries and centers of population in certain parts of Europe developed early in the delta country of the Rhine and the Rhone; and in such countries as Holland and Belgium, the navigation canals connecting the channels of the rivers with important cities have been built in part to control floods and drain the lowlands. Under these conditions, the development and use of canals for transportation has been most favorable. Moreover, the distances involved are not great, so the time factor plays a less important role than in the United States.

AIR TRANSPORTATION

Aviation is the infant transportation agency. It is growing rapidly, however, and has received great impetus from World War II activities in which airplanes were particularly important. European nations have generally followed a policy of subsidizing aviation directly through governmental aid, because, like the merchant marine, it is considered indispensable in case of war. In the United States, however, commercial aviation has not been subsidized except insofar as government contracts to transport mail may be considered as subsidies.

Although aviation uses the skyways as a means of getting goods and services from one place to another, it also makes use of the surface area of much land in the form of airports, landing fields, and repair shops. These land facilities use thousands of acres, and require heavy expenditures in the form of improvements to make them satisfactory for landing purposes. The increasing use of air transportation has made necessary state zoning and related legislation giving municipalities authority to control use of land outside their incorporated limits, not only to provide municipal airport facilites, but to protect safe and efficient utilization of such airports by prohibiting harmful or undesirable uses of surrounding lands.

In general, air services are used heaviest in those parts of the world employing the largest amounts of the older types of transport. However, the airplane is becoming increasingly useful in pioneer regions where rugged relief or dense vegetation has retarded highway and railway construction. The Army Transport Command's wartime achievements prepared the way for global air travel in today's sky-linked world, and air service around the world on regular schedule began in September, 1945.

Air transportation, briefly, can be said to be fast, but expensive, compared with most other forms of transport; and recent improvements make it compare favorably in scheduling, completeness, and comfort with other services. Previous handicaps in reliability and safety are being consistently reduced. Thus, it would seem that air transportation within the limits of space, cost, and certain characteristics peculiar to it will play an important part in competition with other transportation agencies for the business of transporting people and goods in the future.

FUTURE TRANSPORTATION LAND REQUIREMENTS AND RESOURCES

Many have believed that, with the elaborate network of roads and railroads already laid out in the United States, future utilization of land for transportation would largely involve straightening some highways and widening others, with no appreciable increase in new roads or new locations. The trend of transportation development accompanying economic progress and rising standards of living over the years indicates that the future will bring tremendous expansion of transportation facilities.

Prospective Utilization of Land for Transportation. According to the best estimates available, approximately 40 million motor vehicles will be in service by 1960, with a total mileage of some 500 billion miles, or nearly twice that of 1940.[21] Obviously, such increased travel will require a considerable increase in certain types of highways and streets. Some 70 per cent of the present 3 million miles of roads in the United States are rural roads, or "land-service roads" (roads from main highways to individual farmyards). It seems safe to say that only to a very limited extent is there any present or future demand for an increase in such roads. Rather, demands will involve surfacing these roads (with gravel, oil, or similar substances) and making them passable in all kinds of weather. It is in connection with the other 30 per cent of the roads, which may be termed "highways," as differentiated from land-service roads, that the greatest expansion will occur in response to the prospective doubling of travel. The changes necessitated in highways will expand the acreage of land used for transportation.

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[21] It is estimated that motor vehicles in the United States traveled about 260 billion miles over the 3 million miles of highway system in 1939, which is enough miles to drive around the earth at the equator ten times every day from now until the year 4789. Careful estimates of the Public Roads Administration (formerly the Bureau of Public Roads) indicate that highway usage can double within two decades, and that if adequate roads and streets are provided to handle the traffic safely, the future will see the building of vehicles and highways to the point where 500 billions of miles will be traveled in 1960. (Paul G. Hoffman, "American Highways—New Frontiers," in *Roads and Streets,* Gillette Publishing Company, Chicago, Illinois, January 1940, vol. 83, no. 1, pp. 35–36.)

Changes in other forms of transportation in the future will probably not equal, in the aggregate, the acreage involved in prospective highway changes, at least for the next two decades. There will undoubtedly be a great expansion in aviation, and more acreage will be devoted to airports and landing and servicing facilities, but these will not equal the acreages involved in highway changes. Pipeline and related subsurface uses of land will probably be increased. There is little change in railroad mileage in prospect, at least not an increase. There may be some significant improvements in waterways. but the aggregate surface acres will not approach those involved in constructing modern highways needed for the prospective increased road travel.

Unification of Transportation Services. Rapid and largely unregulated development of transportation services in the United States has produced a national transportation problem without a national transportation policy.[22] The serious difficulties of the railroads in recent years are part of the general transportation problem growing out of an intensified and economically wasteful competition for traffic among the several types of transportation, partly the result of governmental favoritism in regard to some types to the detriment of others. This is economically wasteful, because transportation facilities have been created which are considerably beyond the ability of the traffic of the nation to support.[23]

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[22] See "The Report of the Committee Appointed by the President of the United States to Submit Recommendations upon the General Transportation Situation," December 23, 1938, p. 1.

[23] *Loc. cit.*

Some improvement will come with the increase in the general volume of business characteristic of a young, growing nation. A definite national transportation policy, however, should be established to equalize the situation of all types of transportation in regard to regulation, taxation, and subsidies.

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CHAPTER THIRTEEN

URBAN LAND

THE tremendous growth of cities in recent years has concentrated large numbers of people in comparatively small areas. This process, referred to as *urbanization*, accompanying advancing machine technology and the associated shift from farms and villages to urban manufacturing areas, has brought about a fundamental change in the occupational structure of the country, and has revolutionized ways of living and making a living.

NEED AND DEMAND FOR URBAN LAND

More than half the population of the United States (56.5 per cent) lives in urban areas (cities, towns, boroughs or villages of 2500 or more people), and nearly a third in cities of over 100,000. The ninety-six leading metropolitan centers occupy only 1.2 per cent of the land area of the nation, but contain nearly half its total population and over two-thirds of its urban inhabitants. Urban lands total about 12 million acres, of which 3 million are in public streets, parks, and parkways, the other 9 million being devoted largely to residential and industrial sites.[1]

Importance of Urban Land in the Economy. The estimated value of urban real estate (land and improvements) in the United States is some 78 billion dollars—more than two and a half times that of farm real estate, and more than that of any other type of real estate in the nation. Urban real estate alone comprises more than a fifth of the entire wealth of the country.[2]

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[1] National Resources Planning Board, *Report to the President*, 1934, p. 151.

[2] Doane gives the figure of 78.5 billion dollars as the value of urban real estate in 1932, compared with 28 billion dollars for farm real estate. The estimated total wealth of the United States in 1932 was 375.1 billion dollars. The value of all real estate used in manufacturing was estimated to be but 29.5 billion, and that used for transportation 28.5 billion. Mining lands were estimated to be but 3.2 billion, and forests 8 billion. Thus it can be seen that urban real estate is by all odds the most important type of real estate wealth

Cities are dependent upon surrounding agricultural, forest, and mineral lands comprising the countryside, or hinterland, for basic commodities. They are not self-sufficing—they cannot raise their own food, grow their own timber, or extract their own minerals. At the same time, the farmers, forest owners, and miners are dependent upon the large population and modern processing industries of the city to consume their products. Only in a self-sufficing economy could it be said that farmers are not closely dependent upon cities for a market; in modern commercial economies, where specialization and division of labor have been highly developed, there is an interdependence established between modern metropolitan areas and their countryside or hinterland.

Geographically, as well as economically, urban land is dependent upon agricultural, forest, and mineral land. The growth of cities causes an increased demand for land for urban use. This increased demand may be met in two ways—by extending the urban area, or by using the present urban area more intensively. Ordinarily an expanding town will meet its need for additional land area by outward extension from the center into the adjacent countryside. At the same time land in the center of the city becomes more valuable, and if the city expands sufficiently it may be more desirable, or less inconvenient, to build taller buildings rather than to increase area by extension. Thus, the city may expand both up and out. In any case, the surrounding hinterland is a potential supply of urban land. Thus it can be seen that while urban uses and other land uses are complementary, they are in another sense competitive.

Modern metropolises are grown-up crossroads. Their great wholesaling and retailing establishments and their financial, educational, social, and related cultural institutions merely perform for a great number of people the services which were earlier performed by the country store or bank, the crossroads school, and the community church. The village is a village only because its hinterland of agricultural, forest, mineral, or other types of land is limited in size and resources. The hinterland of the modern great city, such as New York, is nation-wide, or even world-wide.

Competitive Uses for Urban Land. There are six major types of urban land utilization: (1) residential, (2) retail, (3) financial

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in the United States. It is also the most important single type of wealth. (R. R. Doane, *The Measurement of American Wealth*, Harper, 1933, pp. 11 and 15.)

and office, (4) wholesale, (5) industrial, and (6) public and quasi-public. Consequently, to determine the highest use for a tract, it must be analyzed on the basis of the factors or conditions which are advantageous and detrimental for each of these six major uses. The competition of these various types of use of urban land tends to utilize more of the earning power of the land, and thus brings in greater net returns than would occur without this competition of uses. This is on the assumption that intelligence and good judgment govern the competition, because the principle of competition implies that if the new use is able to displace the old one, it must be able to produce a higher net income. Obviously, when land, through this competitive process, reaches its highest use, the land is earning its maximum profit. The wastes of supercession involved in the competition of uses in urban land are more than offset by the increased earning power of the land in being stepped up to a higher use. Consequently, this process of supercession through competitive uses represents a net economic gain in the utilization of urban land. However, where intelligent planning and good judgment have been lacking, economic losses rather than economic gains have resulted from wastes of improvements through supercession.

Urban land cannot be fully utilized except with an investment in improvements which in most cases is considerably larger than that in the land itself; it is not uncommon for the improvements to be worth several times the value of the land. Urban land value is so dependent upon its improvements that the problems of the improvement are land problems. Consequently, in urban land utilization some of the most important problems—such, for example, as the ratio of improvement value to site value, building height limitation, rent regulation, and housing—are inconsequential in the utilization of other types of land. Because of the comparatively high use value of urban land, particularly in the larger metropolitan areas, the urban use will ordinarily have a competitive advantage over other uses of land, with the possible exception of transportation uses.

The Urbanization Process. Urbanization is the process which brings urban land into being. To understand this process, it is essential to know why people choose to live in cities, and what conditions or factors make it possible for them to do so. Causes of urbanization may be grouped into four major types of factors: (1) psychological, (2) technical, (3) political, and (4) economic.

Psychological factors play an extremely important part in explaining why people wish to live in cities. Fear, which is a fundamental human instinct, was one of the basic reasons why people in early times banded together in tribes or clans. They feared not only wild animals and marauding hordes, but the mysterious forces of nature. The incurable misery and terror of the Dark Ages—five centuries of violence, paralysis, and uncertainty—created in the European heart a profound desire for security, and thus the need for protection arose above every other concern, and created a wave of city-building and urbanization.

Another psychological factor in explaining urbanization is *gregariousness,* or the desire to group together with one's fellow men. In modern times, this social instinct seems to be even more pronounced—like an insatiable appetite it seems to grow in intensity, the greater the opportunity for its satiation. However, gregariousness is not as important a psychological factor as fear or attempts to secure an effective means of defense against a common enemy. This defense aspect was the chief reason for the development of cities in primitive times, as well as in the first settlements in America. For example, the city of Pittsburgh was at first Fort Pitt.

Religion is an important psychological factor in urbanization. Certain places have been vested with peculiar significance in some religions, and cities like Jerusalem where the Jews worshiped, Athens, and Mecca where the Mohammedans went to worship, are examples of important cities which owe much of their size and importance to religious considerations.

One other important psychological factor helps to explain urbanization, and that is the *level of living* of a people. The development of the city has made possible a combination of convenience and luxury which goes with a higher material level of living. Many conveniences, including police and fire protection, running water, electricity and fuel, can be obtained more easily and less expensively in the city. There is also a great variety of forms of amusement and social life and culture which are not available in the countryside, and in general the whole speed or pace of economic and social life is faster and for most people is more stimulating in the city than in the hinterland.

The above factors help to explain why people wish to live in cities, but they do not explain why it is possible for people to live in urban areas. *Technical, political,* and *economic* factors help explain this. The *technical* factors which are of greatest importance in making urbanization possible include those inventions and discoveries dealing with plumbing science which have improved the sanitation and healthfulness of city life. The discovery and improvement of methods of transportation such as railways, electric cars, and the automobile have made possible a concentration of manufacturing which is an immediate cause of the location and development of most of the largest cities. Other important technical factors include discoveries of means of controlling floods and the discovery of gunpowder.[3]

An important *political* factor affecting development of urban areas is legislation which promotes freedom of movement of people. In most modern nations, there are no restrictions placed upon migrations into or out of cities. In the United States, for example, movement of population from farms to cities is unrestricted, and a child reared in a southern rural area may, when he becomes a man, live in the industrial areas of the eastern states. If economic opportunities are available for employment for large numbers of people in cities, and there are no political restrictions upon migration, there will be a natural tendency for people to move from farm areas to the cities.

Similarly, legislation which promotes freedom of trade, or what might be termed economic freedom between areas, encourages the development of cities. Cities represent areas of great specialization, and where freedom of trade occurs between areas, this specialization will be allowed to develop to its highest possible level, resulting in large industrial and manufacturing areas characteristic of our modern cities. In order to reach their maximum development, urban areas must be allowed to draw freely upon extensive surrounding territory. Any tariff legislation or political barriers restricting trade between areas, or states, or parts of a nation, or between nations, limits the extent to which the city can expand by drawing upon the products and peoples of neighboring areas. If there are a large number of political units, there will probably be political restrictions developed between such units which will seriously hamper the expansion of the central urban area serving such regions.

Many cities today are as large and important as they are because they are seats of government, either local, state, or national. The seat of government not only houses the employees who operate the government, but draws a great many people into its boundaries who directly or indirectly do business with the government officials. In this way the political unit is an important factor determining the sphere of economic unity.

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[3] H. B. Dorau, and A. G. Hinman, *Urban Land Economics*, Macmillan, 1928, p. 16. Dorau and Hinman state that before the discovery of gunpowder, cities were protected by walls, and because life outside them was not safe, these walls served as barriers to city growth. With gunpowder in use, walls were useless and unnecessary.

Any political factor, such as the fear of war, resulting in large defense activities and expansion of industrial enterprise, increases the size and influence of cities, particularly of those cities in which heavy industries so essential for modern armament are located. It is in such larger cities that labor supplies and the big industrial machinery are available for quickly expanding production of certain strategic goods. In spite of the dangers which accompany such increased concentration of industrial activities because of the vulnerability of such concentrated areas in case of enemy attack, the importance of quickly expanding production gives the larger cities with already heavily concentrated industry an advantage in fulfilling industrial requirements for national defense and execution of war operations. As a result, after each war the large cities are likely to be larger, and people concentrated to a greater extent than was the case before the war or defense activity began. This was particularly true following World War II.

Numerous other political factors might be mentioned, including those which give preferential transportation rates to certain areas, differences in tax rates between areas, policies of city development in the form of zoning, and related land use control activities.

Economic factors are an extremely important group in modern urbanization. Perhaps the most important economic factor is the development of modern technology, which has made it possible for the individual farmer to expand his production far beyond the requirements of his family. In an economy in which a self-sufficing agriculture is dominant, large cities are impossible. In other words, when the farmer could produce only enough to feed his own family, there could be no cities, because people living in urban areas would starve. It is now estimated that the modern farmer in the United States can produce sufficient food for himself and 5 other families. This increased production resulting from advancing technology and specialization makes it possible for a large proportion of the total population to live in urban areas. The development of a commercial agriculture coincident with improvements in mechanization has resulted in more than three-fourths of the people of the United States living off the farm, whereas in George Washington's time three-fourths of the people lived on farms.

Increased specialization has continued with expansion of markets and a flourishing technology, so that today the city furnishes a market for a wide variety of skills, and training to absorb surplus farmers and farm youth released by increasing efficiency of modern agricultural production. External transportation facilities, particularly modern highways, skyways, and railroads, have played a very important part in making it possible for cities to secure goods from rural areas for processing and distribution; and an increasingly large proportion of marketing services required in modern economics is being taken over by cities. Fewer and fewer are being undertaken on farms where originally all such services were performed.

Economic forces are the real foundation of modern cities. It is true that technical political forces are important. but economic forces are the ones which make a continuing urban economy possible. Unless economic opportunities are available in cities, men will not live in urban areas, regardless of modern improvements and general desire for city life. Evidence of the importance of economic factors can be seen in the movement from cities to farm areas during severe business depressions, when economic opportunities in urban areas decline; and, conversely, in the great migrations to cities during periods of economic expansion when economic opportunities in cities are abundant.

Urban areas ordinarily have a relatively low birth rate, one which is insufficient to maintain their numbers. Modern large cities depend not only for the commodities necessary for operation of their industries upon rural areas, but also for the youth which furnish the labor supply for operating these industries. When economic forces become unbalanced so that the normal movement of surplus farm folk to the cities is arrested, serious economic maladjustments and distress follow.

THE SUPPLY OF URBAN LAND

Land is fixed and immobile so that in a strict physical sense no particular parcel of land is any more mobile or adaptable for a given human use than any other. The choices of society, however, differentiate locations on the basis of their usefulness to satisfy wants.

The bases of choices of land to be used for urban purposes are very different from those of land for other types of use, especially agricultural and forest use.

Factors Determining Suitability of Land for Urban Use. The physical characteristics of soil, topography, moisture, and temperature are of major importance in determining lands that will be used for agriculture or forestry, as has been noted in preceding chapters. In the case of urban land, these factors are not highly significant, but *location,* or *situs,* is of major importance since a particular site carries with it the trade of a given group for whom it is most convenient. A short distance such as a block, or even less, often makes a great difference in urban land value. In contrast, man will somehow contrive to get at natural wealth wherever it is, so that location does not play such an important role in agricultural, forest, or mining lands.

Cities must, of course, have a water supply from some source. Temperature and sunshine may influence size and construction of dwellings. Hence, these physical factors affect utilization of land for urban purposes, but not ordinarily in a significant or limiting way. Topography, however, often plays an important role in determining which lands will be used for urban purposes, and the intensity of use. For example, select residential sites are often on hillsides or ridges, which are highly prized for their picturesque effect and outlook.

Amount of Land Suitable for Urban Use. No physical factors limit the economic supply of land for urban purposes, aside from the factor of physical space itself, which is a characteristic of all land; forces which are other than physical determine the land to be used for cities, as will be noted in the next section.

If physical space were the only ultimate limitation to the land available for urban use, urbanization could continue indefinitely, in competition with other uses of land, until the entire surface of the earth had been utilized. In such circumstances, there would be no reason for crowded cities and exorbitant rents on particular sites. However, location within the space occupied by a given city is an extremely important matter. The "downtown district" of any large city is an example, familiar to almost everyone, of the concentrated use made of such areas, and the premium put upon accessibility to the center of the city. Not all parts of the city can be located at or near the center; and different urban land uses are therefore grouped in concentric circles around the center, according to accessibility or their ability to pay. Accessibility is a function of the available transportation system or systems, and the circles enlarge as transportation facilities improve.

URBAN LAND UTILIZATION

The concentration of people in urban areas is very definitely localized, as can be seen from Figure 35, showing location of urban centers in the United States. This raises the question as to what makes cities located where they are.

The Location of Cities. The oldest cities were for the most part those which were strategically situated from the standpoint of military defense. The ancient city of Petra, for example, was accessible from only one direction. The hilltop cities of Rome and Athens were located where they could be easily defended. In very early times, defense was the primary factor in locating cities.

Probably the most important factor in determining the location of cities is commerce. The opportunity for trade, which is the lifeblood of urban areas, is the deciding factor in the choice of urban sites in the majority of cases. Where trade routes follow watercourses, cities develop at the points where ocean and rivers meet, or where rivers and creeks meet, or where transportation ceases, at the junction of trails and highways with water routes. An excellent example of the development of cities at such points is the string of eastern cities in the United States—Philadelphia, Baltimore, Washington, Richmond, Raleigh, Augusta, Macon, Columbia, and Montgomery—which because of their location at the head of navigation on the major streams flowing into the Atlantic (the "Fall Line") possess important commercial advantages.[4]

Good harbors, fords in rivers, passes in mountain ranges, and similar locations are important commercial choice sites for cities. For example, New York has a good harbor at the mouth of the Hudson River; Philadelphia is located at the mouth of the Delaware River where it meets the Schuylkill River; and Detroit, Cleveland, St. Louis, and Boston, as well as other important American cities, are located either at the point where the river meets a larger body of

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[4] G. S. Wehrwein, "The Land," in Van Hise and Havemeyer (ed.), *Conservation of Our Natural Resources,* Part IV, p. 323.

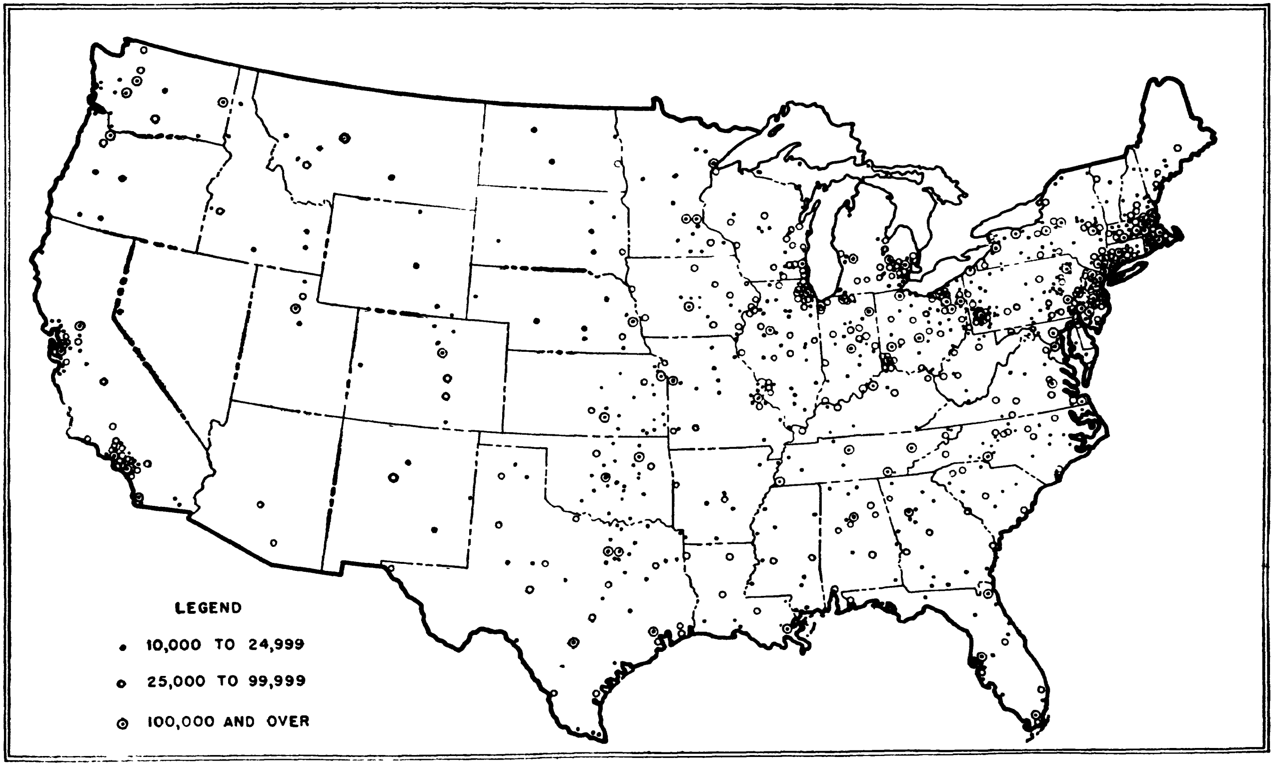

FIGURE 35. Urban Centers in the United States. (Compiled from U. S. Department of Commerce, Bureau of the Census, data for 1940 population.)

water or at the confluence of two rivers. In Europe, London surpasses other cities largely because of its hinterland and its water channel. A study of the location of other major cities such as Liverpool, Paris, and Berlin will reveal that these cities have sites which afford important commercial advantages.[5]

Industry is an important city-building factor, and consequently the force or forces which locate industries are important in determining the location of cities. Many industries are located near the natural resources which furnish the basic materials to be mined and fabricated. Naturally, extractive industries must be operated where the natural resources such as ore, forests, fish, and similar resources are placed by nature. However, extractive industries do not build great cities. It is rather the processing and fabricating of the extracted resources which make possible the modern megalopolis. A large supply of cheap power is of basic importance in developing large processing and fabricating industries. In earlier days, water power was the most important source of energy, and consequently raw materials had to be taken to the source of power and the finished products retransported to the market. Falls and cascades along the famous "Fall Line" extending from New England to the Carolinas became important factory cites. Water power has also influenced the location and development of cities in other parts of the United States. Recent improvements in methods of conveying and distributing electricity make it possible to locate industries at considerable distances from the source of such power, so that there has been greater freedom in the development of urban sites in recent years.

Although natural resources and water power localize certain industries, many are free to locate wherever trade or other advantages are available. Alfred Weber, as was noted in Chapter V, formulated a theory regarding the location of industries when all the factors are mobile, by reducing the factors to weight and distance, and establishing zones of industrial activity located by equal total transfer costs. The weight-losing industries tend to be located near the sources of the raw materials, while those in which the weight loss of the raw materials is minor and perishable commodities tend to locate near centers of consumption. Steam tends to be "agglomerating," concentrative, or centripetal in its influence, while electricity, the automobile, and the airplane tend to be centrifugal, dispersive, or decentralizing in their action on the location of industry, since they tend to shift factories into the outlying regions of the cities.[6]

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[5] For a detailed statement of the commercial advantages of sites upon which these and other important cities of the world are located, see Dorau and Hinman, *op. cit.*, pp. 51–55.

Many other forces operate to determine the location as well as the size of cities. Some cities are known as centers of culture and art; others because of their climate have developed into large health resorts. In some areas, cities have sprung up around an educational institution which was established at a given site, and in others political factors growing out of the designation of certain sites as state capitols or seats of local government account for the growth of urbanization.

The factors which determine the location of cities today are considerably different from those which were of major importance a century or two ago. For example, a hill or peninsula or mountain pass would have been important two centuries ago as a matter of defense, but now their importance would be perhaps one of health or of scenery. In any case, the specific site for a city is determined by physiographic features, although the general location of a city is determined by various economic, social, and political factors, with the economic predominating.

The Structure of Cities. Modern economic forces encouraging development of urban areas cause cities to become roughly star-shaped, as a natural result of what has been called axial and central growth. All cities illustrate both forms, but central growth occurs first in some, and axial growth first in others. Central growth (the clustering of utilities around a given point of attraction) is based on proximity, while axial growth results from transportation facilities and is based on accessibility.[7] The normal result of axial and central growth is a star-shaped city with the growth extended first along the main thoroughfares emanating from the center, and later filling in the parts between. Physiography and other influences, such as avenues of transportation, nuisances, private restrictions, and public control may modify this tendency in any given city.

The land use patterns of cities vary greatly in detail, but certain characteristics or tendencies are common to all cities. The usual city has a denser business district or core around which its economic life revolves. In this center are tall buildings (numerous in large cities) and skyscrapers, appearing irregularly at various points and indicating the location of subcenters. Around the edges of the business district are located light manufacturing and warehouse areas, and along railroad tracks or waterfronts the heavy industries are located. Within the light manufacturing and warehouse area are sprinkled blighted areas and slums; and contiguous to this belt are tenements and workmen's homes. The rest of the city consists principally of residential sections, in which are interspersed stores, parks, playgrounds, schools, churches, and similar structures. There is great variety, however, in the proportion of the city's total area included within these various types of land use, as well as in their locations within the city proper. In a great majority of cities, physiographic forces (including topography, or location of rivers and lakes) will individualize the land use pattern.

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[6] National Resources Committee, "Our Cities: Their Role in the National Economy," Government Printing Office, June 1937, p. 30.

[7] Dorau and Hinman, *op. cit.*, p. 64.

Along main transportation lines radiating from the center of the city are usually located numerous residences of families who work in the city or are employed directly or indirectly in the economic life of the area. These suburban areas often form uninterrupted extensions of the city proper, and become satellite towns which in many cases contain some industries as well as residences. The country estates, country clubs, and open farm lands located between the settled areas or suburbs are all part of the metropolitan region which has as its center the principal city in the locality.

An important characteristic of city structure is the extensive network of streets and alleys used for transportation purposes. There are usually a number of radial streets connecting the heart of the city with the outlying area; and since traffic congestion is likely to develop on these radial streets, circumferential streets usually arise to handle a part of this. These streets are comparatively wide, carrying not only the local city traffic but that between the city and other urban areas, including through traffic. The additional streets necessary to serve through traffic and to provide access to every lot bring about the final network of minor access streets and alleys. Altogether, these streets and alleys comprise a very significant portion of the total land area, averaging from a fifth to a fourth in most cities, though the proportion may be considerably above or below this, depending upon size of blocks, general organization of the city, and its economic activities.

PECULIARITIES OF URBAN LAND

Indestructibility and immobility are the two physical characteristics of land most significant in urban land utilization. Agricultural and forest lands, as has been noted, are not truly indestructible, since they can be appreciably worn out and depreciated, while mineral land can be completely destroyed. However, land whose principal function or service is to afford standing room can hardly be considered destructible through utilization or non-use, in a physical sense. There is no maintenance or depreciation problem in the case of urban land, therefore, corresponding to the need for conservation of agricultural soil, maintenance of forests, or depletion of mineral lands.

Land is physically immobile and a given location may become extremely important economically, although transportation improvement may significantly alter this situation. In the case of urban land (and land used for transportation), certain locations acquire economic significance out of all proportion to that of particular locations in other land uses.

Intensity of Situs Utilization. Those sites singled out by human choice for most intensive industrial or residential use are ordinarily of higher value than those utilized for other purposes. The owner of an urban site has little control over situs. If human choice shifts so that his particular site is in an unfavorable situation, there is little he can do about it; his only alternative is to hope that he can influence human choice so that demand forces will not change, or change in such a way that they benefit him rather than cause him loss.

Modern skyscrapers reveal the extent to which capital and labor can be profitably spent upon a given tract of urban land. This intensive utilization of situs makes the urban landowner extremely vulnerable to the vicissitudes of the business cycle. A site containing an investment as fixed and permanent as a skyscraper has little adaptability to other uses. In types of land utilization where smaller amounts of capital and labor are invested, or where the land is used in its natural state, opportunities are greater for shifting the land into other uses in accordance with changing economic conditions.

There is a wider range in the intensivity of urban land use than in any other form of land utilization. Lands may be used for great skyscrapers and large office buildings, or for comparatively small residences, small shops, or corner gasoline stations involving but a few hundred dollars. Significantly, this range usually prevails within the confines of an average city, investment being heaviest in the heart of the business district and decreasing outward from this center to the city's fringes. The numerous failures in urban real estate development are evidence of the complexity of urban exploitation and investment problems.

Importance of Transportation to Urban Land. The great importance of situs and the intensity of its utilization is closely related to the availability of efficient transportation. In other words, transportation is more significant in urban land utilization than in most other types of land use (particularly agriculture, forestry, and mining). A distance of two or three blocks from a car or bus line is a significant factor in determining city land values, while the same distance in the country is relatively unimportant.

Doses of Labor and Capital Inputs Relatively Large. The intensive utilization of urban land is also characterized by applications of capital in comparatively large units or doses. An additional floor in a building may cost many thousands of dollars, increasing appreciably the amount of capital investment in the given parcel of land. A farmer can approach the margin of intensive utilization gradually by adding a little more or a little less seed, fertilizer, or livestock, but in most types of urban land the applications in arriving at the intensive margin are very large, so that it is more difficult to approach precisely the point of maximum utilization or profit.

Large Fixed Overhead. The investment in fixed, durable capital (buildings and permanent fixtures) in urban land use is large, compared with the annual operating investment. This necessitates use of a large part of the annual revenue to cover the return to invested capital, and the use of a relatively small part to cover operating expenses. Operating expenses on agricultural land relative to fixed capital investment are more than twice as much as those on urban land.[8] Any industry that has a major portion of its total costs recurring annually instead of at long intervals (thirty to fifty years, in the case of urban land utilization) can better adapt itself to current market demand conditions.

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[8] Dorau and Hinman, in a sample study of Cleveland office buildings, estimate that the annual investment to cover operating expenses is about 44 per cent of the fixed capital investment in the case of agricultural land, compared with an estimated 20 per cent for annual operating investment in urban land. (*Ibid.*, pp. 194–195.)

Slow Capital Turnover. The turnover on capital invested in urban land is relatively slow compared with some other major land uses. For example, capital turnover in urban land averages about once in eight to ten years, compared with once in four or five in agriculture.[9] The slower the capital turnover in an industry, the more vulnerable in that industry to fluctuations in economic activity. Although all modern economic endeavor is rather speculative because of specialization and the roundabout process of production, urban land utilization is relatively more speculative than many other types of land use. A modern building has an engineering life of 40 or 60 years, or longer; and anticipation of future demands for these facilities extends forward over this period. Obsolescence often destroys the value of improvements before their engineering life has been exhausted. The occurrence of numerous "ghost towns" evidences the great risks and uncertainties involved in the effort to anticipate future demands for urban land.

Separability of Value of Improvements from Land Resources. An important peculiarity of urban land utilization is the ease with which the value of improvements can be separated from that of the land itself. In cities, improvements added to the land ordinarily do not become inextricably merged with the soil itself, as they do in agriculture. This makes it easier to gauge the effect of a particular tax, or to adjust the tax system so as to influence land utilization in certain desired ways.

Production Costs in Urban Land Utilization. The several types of production costs in urban land utilization may be classified as direct and indirect. Direct costs are actual expenditures or out-of-pocket costs incurred; indirect costs are alternative incomes foregone by the owner. Direct costs include (1) expenditures for clearing, draining, filling, and grading to make the land fit for use; (2) taxes and special assessments on the land; (3) interest on borrowed money, if the owner did not have sufficient capital to pay cash for his land; and (4) miscellaneous costs, including sales commissions to real estate dealers, abstract charges, title insurance, and related expenses usually involved in transferring land ownership. Indirect costs include (1) the loss of income which might be secured if the capital or effort were used in some alternative form of investment; (2) the losses unavoidably incurred when the land is not in its highest and best use; (3) the loss in interest which could be obtained from the above two lost incomes, were they available and invested; and (4) the loss of interest which could have been secured, in other forms of investment, from the funds actually spent as direct costs.[10]

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[9] In 1940, the total value of farm land and buildings was nearly 34 billion dollars, whereas the gross revenue of American farmers was about 9 billion (a capital turnover of about once in 4 years). In contrast, a financial survey of urban housing showed that the average value of rented one-family dwellings on January 1, 1934, in 52 selected cities, was $3142, and that the average annual rental per dwelling unit was $248 (a turnover of less than once in 12 years). U. S. Department of Commerce, *Statistical Abstract of the United States, 1939,* Bureau of the Census, p. 878.) Owners of urban residences maintain that a monthly rental of one per cent of the value of the building is sufficient to pay taxes, upkeep, and depreciation, allowing a reasonable return for interest on investment. This means an annual return cf 12 per cent (a capital turnover of about once in 8 years). However, in many areas urban landlords must be content with a lower rental, and a 10 per cent gross return or less annually (a capital turnover of about once in 10 years) is not uncommon.

Because of the direct and indirect costs involved in urban land utilization, land should not be held out of urban use too long, nor brought into such use too quickly. There are many evidences, particularly in suburban areas, of the tendency to bring land into urban use too soon. Oversubdivision has occurred, and heavy expenses for sidewalks and other special improvements have been incurred without corresponding increases in population to utilize the subdivided tracts for dwelling sites. As a result, annual special improvement assessments have accumulated during the years, and in many cases have resulted in allowing tracts to go to tax deed and revert to public ownership. In such cases, the owner and society would have been better off had the land remained in a less intensive use (such as agriculture or forests) where annual improvement and carrying costs were lighter, until the time when an effective demand was established for dwelling sites on this land. Subdivision and corresponding improvements to fit the land for urban use would then have been opportune.

FUTURE URBAN LAND UTILIZATION

The normal trend of economic opportunities, as a nation with well-diversified industries and resources becomes more mature, is from the country to the city. The extent to which urbanization will proceed will depend largely upon public policies affecting agriculture and industry.

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[10] Dorau and Hinman, *op. cit.*, p. 207.

The Future of Cities. If in the United States, for example, the federal government follows a policy of agricultural subsidies or programs designed to keep the present number of people on farms, urbanization will not increase. If, on the other hand, industrial unemployment can be largely eliminated through governmental or private programs and additional economic opportunities made available in industries, there will be a considerable farm-to-city movement of population, because only about 15 per cent of the total population is needed, with modern production methods, to supply the foods and fibers necessary to support the entire nation. It is impossible to predict which of these two major policies will be followed, but it is estimated that urban requirements in the United States will increase gradually in the future, reaching about 14 million acres by 1960, compared with 12 million acres in 1940.[11]

Regardless of the national policy adopted, there will be great shifts among cities in population growth and development. Although from the strict engineering aspect there is no limit to the size of a city, certain economic, social, and related aspects do limit the size of most cities. Increased costs of living and doing business associated with extreme concentrations of people in small areas tend to check the unlimited expansion of cities.

As economic advantages shift, some cities will grow and others decline. Even during periods of relative prosperity and full economic employment, some cities decline rapidly because of shifts in the resource base. This is particularly true in cities near mining areas or other types of exploitative industries. In the more stable agricultural areas, cities change little even during periods of severe business depression or prosperity. Others experience definite booms. Consequently, it is impossible to predict accurately the pattern of future urban land use.

Improvement of Urban Living. The most optimistic aspect of the future of cities is the growing realization of the modern problems associated with city life. The most important cause of urban land problems today lies in the irrationality of urban patterns.[12]

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[11] National Resources Board, *Report to the President*, 1934, p. 151.

[12] National Resources Planning Board, *Public Land Acquisition in a National Land Use Program: Part II, Urban Lands*, Report of the Land Committee, Government Printing Office, February 1941.

There has been no consistent policy or plan in city development or in urban patterns of land use. As long as urban growth continued at a rapid rate, the basic land use problems of premature subdivision, overcapitalized landholdings, high assessed land values, and similar situations did not become acute because of booms and new settlement. Neglect to plan for growth of urban areas more intelligently has created many serious economic problems.

In most American cities, there is an area of deteriorating houses, marginal business, and general obsolescing both as to location and function, which might be called a blighted area.[13] A small, healthy city is made up of a fairly compact core of business and industrial uses, surrounded by residential areas; but as the city grows, this core expands, driving the residential uses before it. In this zone of transition, inactive residential property waiting to become industrial or commercial is blighted. As long as the expansion is slow and continuous, developing evenly from the central part of the city outward, the amount of blighted or slum property is small, and the blight tends to be temporary. But in the typical American city, blight has run wild and has poisoned from 30 to 50 per cent of the residential area. Increased use of automobiles and better highways have built new business centers, and caused a flight of population to the suburbs. At the same time the urban core has stopped expanding in area because of increased vertical use of urban land through multistoried buildings. As a result of these developments, the zone of transition between business and residential use has become a relatively wide band from which business shrinks away on one side and residence withdraws on the other. New business uses tend to be piled on top of the downtown heap, or skip over the middle ground to establish subcenters in the suburbs, while new residential developments naturally avoid the high prices and squalor of the "orphan district" and go to the unused land and open country.[14]

Slums develop out of blighted areas because property owners allow their property to deteriorate on grounds that it is only a matter of time before the business center will spread to their property. Properties are held for fancy prices based on future expectations that never materialize.

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[13] For a more complete statement of this problem, see Mabel L. Walker, "Urban Blight and Slums," City Planning Studies xii. Harvard University, Boston, 1938.

[14] National Resources Planning Board, *Public Land Acquisition.*

Cities have experienced, periodically, epidemics of wildcat land speculation and premature subdivision. Few cities have escaped the curse of excess platted land.[15] Excess plattage areas tend to become sterile tracts over which settlement passes to areas even farther out, thus putting an even heavier burden on the city for capital outlays before it has had time to write off the bad investments in the premature subdivision, and scattering the city's population over an area more difficult to service and protect.

Premature subdivision is not the only form of overintense land use that plagues cities. For example, in downtown areas, high land values often lead landowners to overbuild and overuse their land in order to meet fixed charges. Office buildings and hotels are frequently erected in an attempt to justify excessive land values and capitalize on congestion. Increased vertical use of tracts by building skyscrapers is the usual reaction to excessive land values. The result of such overintensive use is extreme congestion of traffic and movement within certain parts of the city.

The problem of congestion is one which is becoming increasingly acute in many cities. The failure to plan the streets both as to location and width has caused traffic snarls and has made necessary the one-way routing of street use at certain times of the day, particularly during the morning work hours and the opening and closing business hours of the day. Traffic congestion means more time spent in going to and from work, and delay in transporting and delivering goods, which in the aggregate are important items in the cost of living in congested urban areas.

Overintense use of certain parts of the city results in inadequate areas for recreation, areas which are dark or crowded behind large skyscrapers, narrow streets, crowded tenements, and related problems. In many areas, zoning has been necessary to control the use of land by limiting the size of buildings, the distance which the buildings can be placed from the front of the lot facing the street, or the distance which must be maintained from the next nearest building.

Overuse of urban land also tends to bring about underuse of some lands within the urban areas—vacant lands which should be built upon, as well as the underimproved tracts which should be more fully developed. Both are in part the results of overdevelopment elsewhere. Obviously, it would be much more in the interests of the general welfare if all the tracts were more moderately used.

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[15] In 1929, nearly half the total lots of the city of Cleveland were vacant, and Chicago had platted enough suburban land early in the twenties to house 18 million people. (*Ibid.*)

It is not likely that the rapid changes which occurred during the past few decades—particularly the tendency to overbuild or construct mechanical monuments—will be continued. One of the great advantages of mechanical standardization is the decrease in number of variables in the environment. Once constants are established in urban planning, the trend toward higher densities and overbuilding will no longer continue.[16]

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[16] Mumford believes that, as we design our cities for permanent living and not for impermanent financial exploitation, there will undoubtedly be discovered a whole series of biological and social constants that vary little from generation to generation, and in any case such variation as is necessary will occur within and not in opposition to the permanent form. (Lewis Mumford, *The Culture of Cities,* Harcourt Brace, 1938, pp. 415 ff.)

PART FOUR

LAND USE PROBLEMS AND POLICIES

CHAPTER FOURTEEN

LAND TENURE AND TENANCY

EVERY individual enjoys a claim, right, or form of tenure with respect to some land, varying from the right of passage over it on a street, highway, or trail to ownership in fee simple. We learned in Chapter IV that no one enjoys absolute ownership, and that society entrusts certain rights in the use of land resources to private individuals, as long as such trusteeship best serves the social interest. Governments have taken away many private rights in land through use of the police power, eminent domain, and taxation. Thus, landowners share their property with the state to some degree, often being greatly restricted in uses which they can make of their lands, while in other cases they are restricted little, if at all.

Land Tenure and Tenancy Defined. Land *tenure* is a broad term covering all those relationships established among men which determine their varying rights in the use of land. It deals with the splitting of property rights, or their division among various owners, between owner and occupier, between owner or occupier and creditor, and between private owners and the public; and it includes assessment of taxes on private rights, and regulation of land use through various social control devices. *Tenancy* is a much more limited term than tenure and refers to the occupier's or land operator's practice of renting the land from other individuals (known as "landlords") who own it. Thus, tenancy is merely one phase of the general field of land tenure, dealing with the splitting of rights between owner and occupier.

A complete analysis of land tenure includes land credit, land taxation, police power, eminent domain, and other social controls, since all these involve the division of property rights in land—either between owner or occupier and financier, or between private individuals and public bodies. However, since land credit problems are so closely related to land values, or to the level at which rights are exchanged,[1] and since taxation is a peculiarly important social control device apart from police power, eminent domain, and other procedures of public control and regulation, these are analyzed in separate chapters. Thus, for each major land use, only those aspects of tenure involving tenancy, or the division of rights between owner and occupier, those involving division of title among various private owners, and those involving division of ownership between private and public owners—or extensivity, rather than intensivity—will be discussed in this chapter. Farm tenancy will be given much attention, because of the peculiar and widespread problems associated with it in the United States. Tenure problems of other major land uses, aside from urban tenancy, chiefly concern private-public ownership issues, or division of title among various private owners.

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[1] Salter divides those aspects of human behavior in which property rights in surface units are the dominant directing factor into two groups, as prob-

FOUNDATIONS OF LAND TENURE AND TENANCY IN THE UNITED STATES

The rights and privileges of the public and of private individuals in all classes of land are established by law and custom. Consequently, tenure is more a phase or function of cultures, laws, customs, and societal institutions than is land utilization; but it is not necessarily independent of physical backgrounds and foundations. Land tenure of course, affects land utilization because production may be increased or reduced by the laws, customs, and institutions associated with land tenure.[2]

America's Traditional Land Policy. Early plans for disposal of the public domain emphasized the need of revenue to operate the new federal government. It was also the avowed purpose of early American land policy to establish family-sized farms on the public domain, owned by those who operated them. The methods used to dispose of the public domain, including the credit system, the cash sale system, and the preemption procedures followed in the early

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lems arising from (1) land exchange, and (2) land tenure. Under the first group, he lists land ownership, land values, and land transactions; under the second, tenancy, land credit, title splitting, land taxation, and land regulation. (See L. A. Salter, Jr., "The Content of Land Economics and Research Methods Adapted to Its Needs," *Journal of Farm Economics,* vol. XXIV, no. 1, February 1942, pp. 226–247; and the author's comments, *ibid.*, pp. 249–251.

[2] For example, medieval agricultural production was relatively small, because of the system of feudal land tenure and the lack of scientific farming knowledge. See Social Science Research Council, "Research in Agricultural Land Tenure: Scope and Method," Bulletin 20, New York, April 1933, p. 2.

part of the last century, as well as the later policies of giving the land outright to settlers under homestead laws—all were designed to accomplish this purpose.

The feeling was widespread that unlimited freedom of disposition of property in land would best serve to attain the major aim of establishing family-sized farms owned by those who operated them. It was argued that this freedom of disposition of property in land had the advantages of elasticity and readiness of adjustment to changing conditions, so that under it each individual was free to acquire and own the size and type of farm unit he was best fitted to handle. This belief rested on the assumption that the majority of individuals will act continuously in their own interest, and that the individual interest coincides with the social or public interest.[3] The extent of farm tenancy in the United States today, and the problems associated with it, are ample evidence that in practice the principle does not work out altogether in this way and that a number of socially undesirable results have stemmed from our traditional policy of complete freedom of disposition of landed property.[4]

Legal Background of Land Tenure in the United States. American land law springs largely from English common law. In eleventh century England, the king assumed supreme right over all land, and as lord sovereign divided the land among his vassals, who had no original rights in the land, but only those rights deriving from the king's grant. The mesne lords in turn transferred the land to their tenants; but all land, in the last analysis, belonged to the king. Each individual in the chain, below the rank of lord, held or used the land on condition of performing certain services or duties. Thus, all land was "feudal" land, as contrasted with "allodial" land which the owner possessed in his own right; and "tenure" concerned the relationships between the grantor and the grantee in regard to rights in land.[5]

This feudal relationship between lord and overlord has given rise to court controversies in the United States. Some courts have held that there were no limits to the extent to which the common law was adopted in the Colonies, while others have insisted that only the portion was adopted which was applicable to colonial conditions. The fact remains that in colonial times oaths of fealty to the lord were taken, and services (often nominal rents) rendered. Some authorities argue that after the Revolutionary War the feudal position of lord sovereign, previously occupied by the king, passed to the state with other sovereign rights. Statutes or judicial decisions have declared restricted tenure non-existent in some states—that is, the last vestige of feudal import has been removed, and individual title derived from the government involves the entire transfer of ownership of the land; or in other words, ownership is purely allodial.[6]

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[3] L. C. Gray, "Our Major Land Use Problems and Suggested Lines of Action," U. S. Department of Agriculture *Yearbook*, 1940, Govennment Printing Office, p. 405.

[4] After title passed to private owners, there were no restrictions on the right of the owner to dispose of the land in any way or at any time he might desire, although state laws were passed to determine the direction of ownership, in case the owner died intestate.

[5] Cf. H. W. Spiegel, *Land Tenure Policies at Home and Abroad,* University of North Carolina Press, 1941, p. 8.

Regardless of the relative merits of these arguments, the fact remains that in the United States the people traditionally consider ownership as assigning absolute control. Consequently, various schemes of land reform, like the proposal of land nationalization which had a wide following in England, would not be received to the same extent in the United States, where the people are not accustomed to regard the right of the landowner as limited.[7] The almost unlimited freedom of disposition of property in land, developed in the United States through our traditional land policy of rapidly settling the public domain, has created a widespread feeling on the part of most Americans that the rights of individual owners are not limited. Not until this aspect of American culture is significantly changed will certain desirable reforms in farm tenancy and related land tenure adjustments, including major soil conservation and related programs for wise utilization of natural resources, be established and operated most effectively.

AGRICULTURAL LAND TENURE AND TENANCY

Public ownership has not been generally recommended, nor has it been a major issue in the United States for agricultural land, as it has been for certain other major types of land. American agriculture, as we have noted, consists of millions of small, family-sized, generally diversified units; and many of the more serious economic and social problems associated with private ownership and exploitation (particularly in mineral and forest lands) have not arisen in agriculture. Farm tenancy, or the division of property rights between agricultural landowners and occupiers, has given rise to serious problems in the United States. Consequently, analysis of agricultural land tenure problems and policies in this chapter is concerned with farm tenancy, its extent, trends, causes, characteristics, and arguments for and against it, with methods of improving it.

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[6] These states are Connecticut, New York, Maryland, Virginia, Ohio, Wisconsin, West Virginia, Minnesota, California, and possibly Kentucky. (*Ibid.*)

[7] Spiegel indicates that in England, where the doctrine of "feudal" or limited tenure was never given up, various schemes of land reform, and even the proposal of land nationalization, found a wide response because the people were accustomed to regard the right of the owner or occupier as limited. (See *ibid.*, p. 10.)

Farm tenancy in the United States has recently received a great deal of attention, as reflected in the report of the President's Committee on Farm Tenancy (1937), the passage of the Bankhead-Jones Farm Tenant Act (1937), the passage of some state legislation dealing with landlord-tenant relations, and the appointment of state farm tenancy committees. The depression thirties, which were accompanied by severe drought and crop failure, aggravated the problems associated with farm tenancy, and helped to focus public attention upon the nature of farm tenancy and its place in the economy.

The Census of Agriculture defines farm tenants as farmers who rent all the land they operate. This would include all croppers, cash renters, standing renters, and various kinds of share renters who rent all their land. Sharecroppers are listed separately, and are defined as tenants who own no work stock. The laws of some states define sharecroppers as tenants, while others hold that sharecroppers are laborers.[8] The census classifies farmers who rent part and own part of the land they operate as part owners, although the problems which arise in connection with the rented portions of these farms are in many respects similar to the problems associated with full tenancy and sharecropping. The census makes a separate listing showing farms operated by hired managers, and these operators should be considered as employees or laborers rather than as tenants.

Trend of Farm Tenancy. Farm tenancy has existed in one form or another for thousands of years; even in early historic times farmers rented land, paying a share of the crops, cash, or personal services. In the United States, some farmers have always rented land, but only in the last seventy-five years has farm tenancy assumed major proportions. In 1880, a fourth of the 4 million farmers in the nation were tenants, and during the next fifty-five years the number of tenant farms increased from about a million to nearly 3 million (a gain of 180 per cent), while the number of farms increased only 32 per cent. Thus, in 1935, 42 per cent of the 6¼ million farmers were tenants. From 1935 to 1940, the total number of tenants, as well as the number of tenants in proportion to the total number of farmers, declined. The percentage of tenancy in 1940 was 39 per cent, and the total number of tenants, 2,361,000, compared with 2,865,000 in 1935.

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[8] See U. S. Department of Agriculture, *Farm Tenancy,* Bureau of Agricultural Economics, County Planning Series no. 9, p. 4.

Farm tenancy increased in every decade from 1880 to 1930. The proportion of tenants to all farm operators declined slightly, however, from 1930 to 1935 (42.4 per cent to 42.1 per cent) and still more from 1935 to 1940 (42.1 per cent to 38.7 per cent). The greatest increase in the percentage of tenancy occurred during the decade from 1890 to 1900 (28.4 per cent to 35.3 per cent).

The relatively large increase in tenancy during the decade of the nineties may be in part accounted for by the fact that free land in the United States substantially disappeared after 1890. All figures on tenancy must be used with care, because of the limitations of census data. How many croppers were counted as tenants in 1880 and what the rate of increase was before 1920 in the number so counted will never be known. It is generally recognized, however, that many were not counted as tenants at the outset, and that the count has increased as the enumerators have learned better how to follow instructions. It is also known that during these years more and more plantations were being broken up into cropper holdings.[9]

Extent of Farm Tenancy in the United States. Approximately two out of every five farmers in the United States rent all the land they operate, and an additional tenth rent a portion of their operating units. Consequently, almost exactly half the farmers of the United States rent all or part of their farms.[10]

Farm tenancy is more pronounced in the South than in any other major section of the United States. (See Figure 36.) More than half

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[9] Cf. J. D. Black and R. H. Allen, "The Growth of Farm Tenancy in the United States," *Quarterly Journal of Economics*, vol. LI, May 1937, pp. 399 ff.

[10] The 1940 census of Agriculture lists a total of 6,096,799 farmers, of whom 3,084,138 are full owners, 615,039 part owners, and 2,361,271, or 38.7 per cent tenants. A total of 36,351 farms are operated by hired managers.

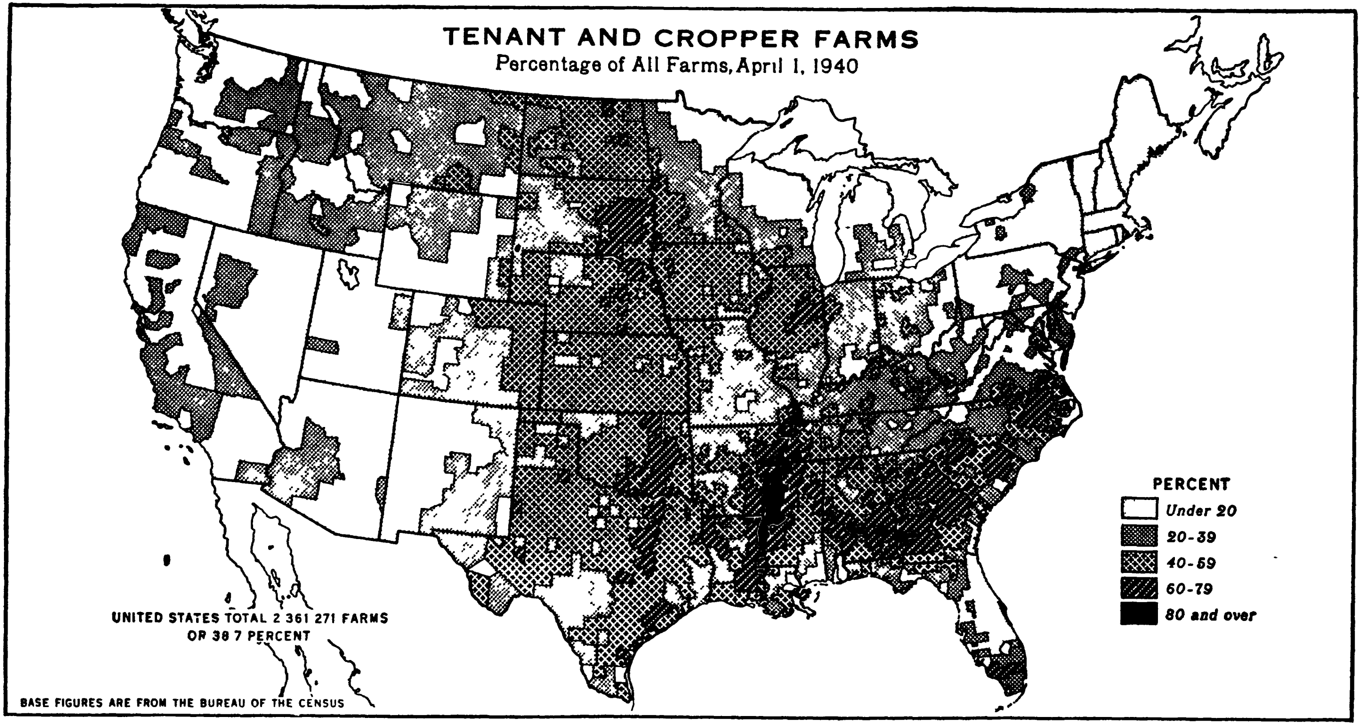
TENANT AND CROPPER FARMS
Percentage of All Farms, April 1, 1940
PERCENT
Under 20
20-39
40-59
60-79
80 and over
UNITED STATES TOTAL 2 361 271 FARMS OR 38 7 PERCENT
BASE FIGURES ARE FROM THE BUREAU OF THE CENSUS

FIGURE 36. Tenant and Cropper Farms as a Percentage of All Farms, 1940. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

of all farmers in the sixteen southern states are farm tenants. This number (which includes croppers) comprises almost two-thirds of the total tenants and croppers in the nation. In the northern states (the 21 states in the North Atlantic and North Central divisions), about a third of the farmers are tenants, although the proportion varies considerably among the states within this group. Tenancy is lightest in the eleven western states, fewer than a fourth of the farmers being tenants.

The proportion of land in farms under lease is considerably different from the above figures. For example, in the western states where tenancy is lowest, large acreages of rented grazing lands make up more than two-fifths of all western land in farms operated under lease. (See Figure 37.) These figures do not include some of the federal, state, railroad, and absentee-owned land rented to ranchmen for grazing purposes, so that the actual proportion of rented land is even greater. Another factor accounting for the difference in proportion of rented land and proportion of tenant farmers is the fact that farming corporations are extensive renters in the specialized cash crop areas where much of the work is done by migratory agricultural laborers. Moreover, there are a number of "pockets" in these cash crop areas (and also in the semi-arid dry farming areas) where the tenancy rate is comparatively high.[11]

There is a close correlation between the amount of farm tenancy and the type of farming practiced. Areas of high tenancy are predominantly those of specialized cash crop production—especially the production of cotton, tobacco, wheat, and corn. Rental contracts are usually made for one year, without specific assurance of renewal. Moreover, most leases provide for payment of rent as a share of the crop. One-year leases and share rentals tend to encourage production of annual staple crops for sale, and are not readily adaptable to livestock farming, fruit-growing, dairying, or similar types of farming which do not complete one cycle of production for several years. The highest rate of tenancy exists on cotton farms, where two-thirds of all the operators are tenants. Tenancy in tobacco, corn, and wheat farms is also high. Tenant farmers make up about 45 per cent

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[11] In some of the western states where Orientals make up a significant portion of farm operators, state legislation prohibiting them from owning land has been a special factor tending to increase tenancy rates. However, purchase of land by American-born children of Oriental parents is tending to offset the effect of these laws. (See *Farm Tenancy,* Report of the President's Committee, 1937, p. 36.)

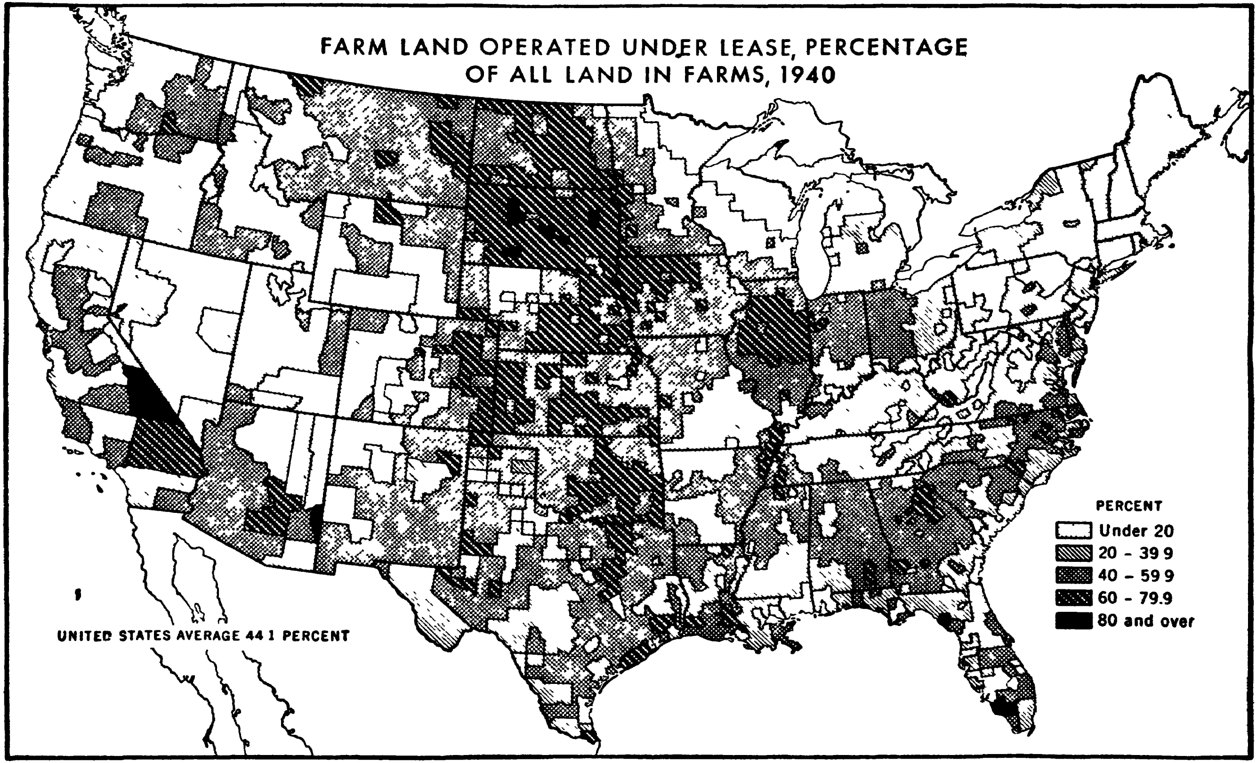
FARM LAND OPERATED UNDER LEASE, PERCENTAGE OF ALL LAND IN FARMS, 1940
PERCENT
Under 20
20 - 39 9
40 - 59 9
60 - 79.9
80 and over
UNITED STATES AVERAGE 44 1 PERCENT

FIGURE 37. Farm Land Operated Under Lease as a Percentage of All Lands in Farms, 1940. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

of all farmers, in areas where these three types of agriculture predominate. The average proportion of tenancy is approximately half of all farmers in areas where rice and sugar cane predominate. In contrast to these relatively high percentages of tenancy, less than a fifth of the farmers in dairy regions and less than a third of those in general farming areas are tenants.

Causes of the Growth of Farm Tenancy. The rapid growth of farm tenancy in the United States, where a federal policy of encouraging operator ownership has been diligently followed, raises many questions as to how and why a high proportion of tenancy has developed. No one single factor has been the entire cause, but farm tenancy tends to increase with the commercialization of agriculture.

Land Ownership in Fee Simple Absolute. One of the most important factors—considered by some the most important—in the growth of tenancy is our policy of permitting land to be made private property in fee simple absolute.[12] This policy permits property accumulation and transfer with practically no restrictions on its use or disposition. It is undoubtedly correct to say that our ancestors, who struggled so long to free themselves from the restraints of a feudal land tenure system, went too far in the opposite direction in their zeal to create conditions which would eliminate such restraints. For example, primogeniture and entail were abolished early in the history of the United States, to discourage retention of large tracts in the hands of one family and to impede development of a landed aristocracy like that which had developed in Europe. The American system of land ownership in fee simple absolute makes land freely salable and easy to mortgage. This freedom of use and disposal of land has made it possible to treat land much the same as any other commodity. The most undesirable results of complete freedom of disposition of landed property were postponed in a young pioneer society where there was a rapid expansion of economic activity and profit opportunities through various speculative and financial devices.

Disposition of the Public Domain. Another important factor in tenancy growth in the United States has been the procedure followed in disposing of the public domain. For nearly three-quarters of a century before 1862 when the first homestead act was passed, public domain tracts were sold at public auction, with practically no limitations on the amount of land acquired or purposes of acquisition. Moreover, these sales continued until 1890, and homestead policy was then modified to permit money commutation of part of the required period of occupancy.

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[12] Cf. *ibid.*, p. 39; and Gray, *op. cit.*, pp. 404 ff.

The rapid disposal of much of the public domain in small units of 40, 80, or 160 acre tracts through sale and homestead entries has resulted in division of the western lands into numerous small holdings. The dry farming and ranching practices adapted to the arid and semi-arid regions require considerably larger acreages than these for satisfactory operating units, or even larger than the maximum of 640 acres which the amended Homestead Act of 1916 granted.[13]

One of the most serious land use problems of the arid and semi-arid regions is that of blocking the numerous small ownership tracts into units of economic size controlled for maximum productivity. These numerous small tracts are scattered in shotgun fashion among many types of owners, including railroads, investment and mortgage companies, commercial banks, insurance companies, land banks, non-resident individuals, non-operating residents, resident operators, county, state, and federal governments, and others (see Figure 38). The thousands of separate properties, combined with absentee ownership, makes the problem of working out effective utilization difficult. The numerous small absentee-owned, scattered parcels necessitate farmers and ranchers leasing from several owners residing in various parts of the nation. This places the operator in an uncertain position because he has no assurance from year to year that he can maintain his operating unit intact. This insecurity encourages misuse and abuse of the land. Considerable progress in blocking out the small tracts and establishing more secure occupancy and use of farm and ranch lands has been made in recent years by: (1) consolidation of farms and ranches by the more successful ranchers taking over lands abandoned by their less successful neighbors; (2) voluntary grouping of ranchers to form cooperative grazing districts

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[13] Studies show that some 4000 acres of average range land are required for a small family ranch operating unit without irrigation. If irrigated lands or wild hay meadows are available for hay production, the acreage of range land necessary for a satisfactory family unit can be reduced in the ratio of about 12 acres of range land for each acre of hay land. Thus, if a ranch family operated 100 acres of hay and about 2500 acres of grazing land, it would be a fairly adequate family-sized ranch unit. (See M. H. Saunderson, "A Method for the Valuation of Livestock Ranch Properties and Grazing Lands," Montana Agricultural Experiment Station Mimeographed Circular 6, March 1938). In the case of dry farming lands, 800 acres are necessary for fairly efficient operation of a three-plow tractor with its associated equipment. With this size of unit on the better dry farm lands of the semi-arid sections, the average operator can earn a satisfactory labor income for the year for family living expenses. (See R. R. Renne and H. H. Lord, "Assessment of Montana Farm Lands," Montana Agricultural Experiment Station Bulletin 348, October 1937, pp. 53–56.)

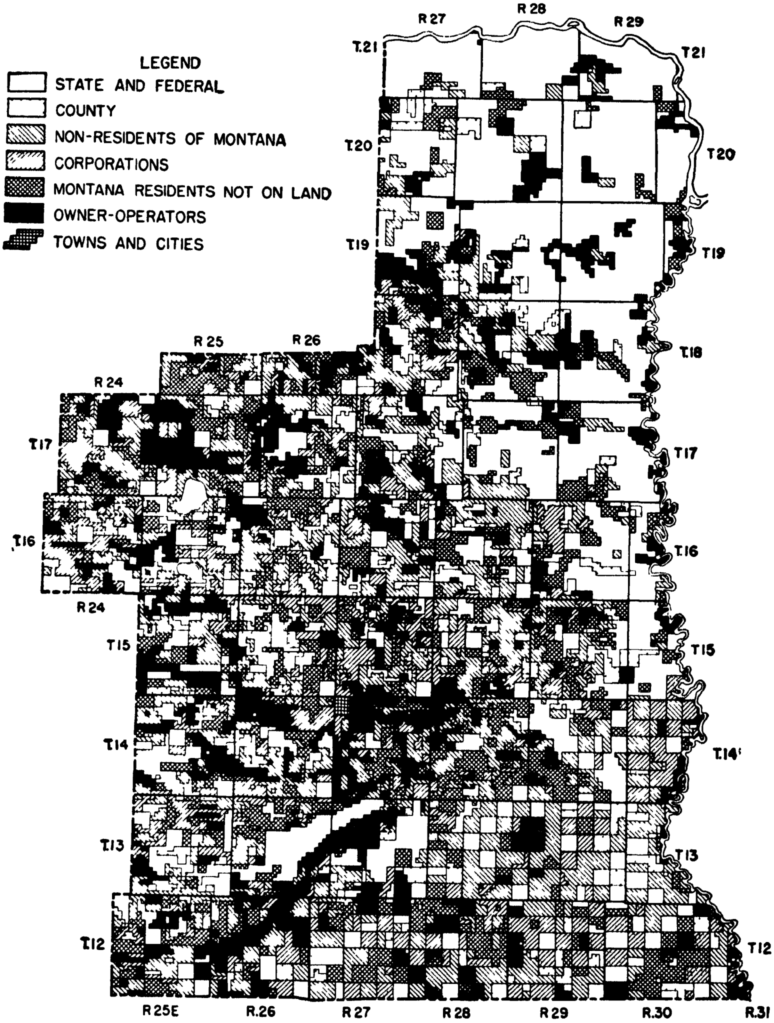

Figure 38. Ownership Pattern of Petroleum County, Montana, March 1, 1937. (Source of data: Montana Agricultural Experiment Station.)

and acquire effective control of a given area (collective tenure);[14] (3) establishment of adequate control of the public range in areas where federal lands are a significant portion of the total through the Taylor Grazing Act; and (4) outright purchase of the numerous small privately owned tracts in selected areas by the federal government to block out adequate operating units.

Speculation and High Land Values. A third important cause of tenancy growth in the United States is speculation and resulting high land values, which are closely associated with the two preceding factors. A considerable amount of land speculation was due to the rapidity with which the public domain was disposed of, and the expanding market for agricultural products accompanying rapid increase in population. Many believed that, since land is physically limited in amount, it would not be many years before continued population increase would result in a scarcity of agricultural lands and an increase in agricultural prices. Land values rose almost continuously until 1920, and this upward trend caused a widespread practice of anticipating in advance further increases in land values and capitalizing these anticipated rises into current values. The result was to force land values out of line with land productivity, with resulting increases in taxes, interest, and related overhead charges.

Agricultural prices in the interwar period (the years between World War I and World War II) were not sufficient to support these high costs, and large numbers of farm bankruptcies and foreclosures resulted. In most cases, these forced transfers caused ownership to be taken over by the creditor (usually an absentee owner) and tenancy increased accordingly.

The Cropper System. Certain conditions which developed from the freeing of slaves at the close of the Civil War help to account for the high proportion of tenancy in the southern states. The fact that planters had ample land and experience in management, but no funds for paying wages to their former slaves, together with the availability of hundreds of thousands of recently freed slaves, unaccustomed to wages, uneducated, improverished, and familiar with cotton cultivation under rigid supervision and direction, made a perfect combination for development of the cropper system of tenancy. Theoretically at least, the cropper system tended to give the former slave a greater interest in his work, and to force him to share losses due to his own neglect, at the same time that it minimized the cash outlay of the landlords who furnished the land, teams, and implements and usually secured half the crop.

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[14] See M. H. Saunderson and N. W. Monte, "Grazing Districts in Montana: Their Purpose and Organization Procedure," Montana Agricultural Experiment Station Bulletin 326, 1936.

The very low economic and social status of Negro croppers in the South has caused many to condemn the cropper system. The social status of most Negro croppers is only once removed from slavery. With the serious economic problems resulting from declining foreign markets for American cotton in recent years, the economic aspects of the cropper system have been extended to poor-white farmers, who have increased in number.

Recurring Economic Depressions. Economic depressions stimulate farm tenancy growth. During depressions, there is a tendency for wealth, particularly that represented by property in land, to concentrate in the hands of the more astute and financially fortunate. Prices of farm products tend to be among the first to decline during depressions, and drop faster and farther than prices of other commodities. At the same time, charges which make up a large proportion of the farmer's cash expenses (like taxes and interest) are fixed, or decline very slowly. Heavy reliance upon the general property tax, combined with the fact that farm real estate constitutes about five-sixths of the farm investment, indicates how important fixed charges like taxes and interest can become during depression periods of greatly reduced farm income. When agriculture was less commercialized, depressions were not so disastrous, but the increasing commercialization of agriculture through mechanization and specialization increases the amount of farm bankruptcies, foreclosures, and poverty accompanying depressions.[15]

Credit and Tax Policies. Credit and tax policies have played important roles in farm tenancy growth. In earlier years, farm loans were made for very short periods of from three to five years, with high interest charges running from 8 to 12 per cent, or more, and loans were made on high appraised values. Under these conditions, a high proportion of farm bankruptcies and foreclosures were inevitable. Control by "landlords" over agriculture may be preventive or restrictive, but the federal land banks which now hold about two-fifths of the aggregate farm mortgage debt are, through their credit policies, very important in determining land utilization and tenure. Agricultural land valuation and credit problems, and the use of credit instruments as methods of land use and tenure control, are discussed in more detail in the following chapter. The tax system of the United States, with its predominant emphasis upon general property, has placed a particularly heavy burden upon farm ownership. Inequalities in land assessment, heavy local tax levies, and related tax factors have contributed significantly to increased farm tenancy through forced transfers of land ownership by tax deed and mortgage foreclosures in the semi-arid Great Plains.

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[15] Three-quarters of a million farms changed ownership through foreclosure and bankruptcy sales during the five depression years, 1930–1934. Large numbers were also transferred to creditors or sold to avoid foreclosure. (See *Farm Tenancy,* Report of the President's Committee, pp. 44–45, for a more detailed statement of the depression forces which operate to increase farm tenancy.)

Natural Hazards. Droughts, floods, and other natural hazards which were particularly pronounced in the thirties have discouraged farm ownership in some sections. High ownership risks and resulting economic vulnerability in marginal areas like the Great Plains and similar semi-arid sections, where natural hazards are particularly great, have caused many farm operators to regard tenancy as more desirable than ownership, particularly with existing credit and tax policies.[16]

Landlord-Tenant Relations in the United States. The arrangements effected between landlord and tenant regarding the rights and duties of each have a marked effect on land utilization and the economic and social status of farm tenancy.

Forms of Rent Payment. Various forms of rent payment include cash, livestock share, crop share, crop share cash, sharecropping (where the tenant supplies labor only, the landlord supplying land and equipment), standing rent (where a stated amount of the principal crops is paid as rent), or stated price renting (where there is an agreement to raise crops or stock and deliver them to the landowner at a stated price per unit). Under the livestock share and crop share forms of rent payment, the share which goes to the landlord varies in different areas of the country. The most usual arrangement under livestock share leasing is for the landlord and tenant to share the ownership of all, or a large part, of the productive livestock, usually sharing receipts and expenses on a half and half basis, except that the tenant supplies all the labor.

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[16] It is significant that in some areas of the Great Plains in the thirties owners voluntarily allowed their lands to go to tax deed, on the grounds that they could rent the lands from public agencies after tax-deed foreclosure cheaper than they could afford to own the lands and pay the high taxes charged. For a brief statement showing the economic significance of fluctuating farm prices and relatively high taxes in areas where natural conditions create a high degree of uncertainty in crop production and range carrying capacities, see R. R. Renne and H. H. Lord, "Montana Farm Price Variations," Montana Agricultural Extension Service Circular 93, June 1938, and "Montana Farm Taxes," Montana Agricultural Extension Service Circular 94, June 1938.

Crop share renting is the most common method of leasing for the country as a whole, and in many areas a half-and-half share basis is common, although there is a tendency for the share rent paid to be smaller on very intensive crops like cotton and tobacco than on less intensive crops like small grains and corn. Livestock share leasing usually grows out of or results in a close association between the landlord and tenant. Crop share renting is particularly well adapted to areas in which a single cash crop is produced. It has a very important weakness in that it provides little opportunity for the production of livestock and tends to emphasize the sale off the farm of most of the crops produced, which tends to deplete the soil. Moreover, studies indicate that there is no necessary relation between the landlord's share and the yield or productivity of the soil. In many areas, division of the share between the landlord and tenant seems to be established and continued more by custom than by yield or productivity rating of the lands.[17]

Under cash renting, the tenant ordinarily has the greatest degree of freedom in the utilization of the land of any form of renting. Cash renting tends to lead to less soil exploitation than crop share renting because livestock enterprises are more intensively developed, security of occupancy is greater, and the cash tenant is usually in a much stronger financial position than the share tenant. This is the typical picture where cash renting is common, although in some share renting areas only the smallest and poorest farms are rented for exorbitant cash rates to highly insecure and financially weak tenants. Under these conditions, results of cash renting are decidedly unfavorable.

Length of Leases. A great variation also exists in the length of lease periods, and in the form of leases. Many leases are for only one year, others are for periods of five to ten years, or even longer. The year-to-year lease is prevalent throughout the United States, and the most common plan is for the lease to run indefinitely and to close only by a termination notice given several months before a specified date. A less common arrangement is for landlords to grant relatively long-term leases, usually from three to five years, but reserve the right to terminate the lease by notice some time in advance of a set date. This does not give the tenant much more security of tenure than the year-to-year lease, and makes it impossible for him to plan his farming operations over a period of years. On the other hand, fixed leases of three or five years, or longer, have many disadvantages from the landlord's point of view, although such fixed-period leases can be written to give the landlord an option of terminating the lease at the end of any crop year, provided that the tenant is definitely unsatisfactory, as indicated by doing certain things prohibited in the lease.

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[17] It would seem logical to assume that on the more fertile and productive lands the share which goes to the landlord would be greater than that in the case of very poor or unproductive lands, because on the latter the proportion of the total return required for producing the crop—the tenant's labor, cash expenses, etc.—is greater and the tenant would have to have a larger share of the total product to meet his expenses. In some preliminary studies in Montana by the author, no correlation seemed to be found between the division of the share and the productivity rating of the soil.

The relationships between tenant and landlord, however, cannot be improved merely by signing the landlord and tenant to a fixed contract for a period of years. Harmonious working relations between the two must be built upon a sound basis approximating the character of a business partnership, and this requires an intelligent and sane attitude on the part of both. Tenancy conditions can be made quite satisfactory and socially constructive without the landlord's cooperation, through legislation placing more managerial freedom and responsibility in the hands of the operator—as has been done in some other countries.

The use of provisions in leases that either party must give the other notice a specified period in advance of the date of termination, if he plans to terminate the contract (providing that this period is sufficiently long to assure the tenant time to arrange for another place) is about the most effective way of dealing with the farm lease problem, so far as term of leases is concerned.

Written vs. Verbal Leases. Most farm leases in the United States are merely verbal agreements or understandings between landlord and tenant. In many areas written contracts are relatively few, or practically non-existent. The oral lease is convenient for making changes, but is likely to give rise to misunderstandings which would be less likely with a specific written contract, and may cause difficulties or failures to renew leases at the end of the year.

Insecurity of Occupancy. Most farm tenants do not have any security of occupancy from year to year.[18] Without such security, tenants are not likely to use farm practices which look further ahead than the present year. The likelihood of moving, combined with the fact that upon departure tenants cannot ordinarily obtain compensation for improvements made, restrains them from making improvements on the farm where they are temporarily located. Statutes in many states, as well as the common law, cause an improvement affixed to the soil by an agricultural tenant to become the property of the landlord at the termination of the lease. Some states have already changed their statutes to allow tenants to take away removable fixtures and improvements, while other states have changed the common-law rule by requiring landlords to make all repairs and improvements; but neither of these adjustments covers improvements that cannot be removed. Farm tenants do make many such improvements, including application of lime and fertilizer, construction of fences, ditches, and roads, and terracing.[19]

If productivity is to be maintained, tenants must make improvements. Consequently, plans should be worked out which will encourage them to do so. This will involve incorporating into the written lease plans for compensation to the outgoing tenant for the unexhausted value of such improvements. Although, at present, the number of written farm lease contracts is comparatively small, there has been some tendency toward the increasing use of written leases. Compensation for improvements made by the tenant may be of two main types, (1) improvements which the tenant cannot make without prior consent of the landlord, and (2) improvements which he is free to make without consulting the landlord. More permanent types of improvements (buildings, permanent fences, commercial fruit and vegetable enterprises, and the like) are usually included in the former, and items like application of fertilizer and manure, limestone, and related improvements in the latter.

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[18] Marshall Harris, "Compensation as a Means of Improving the Farm Tenancy System," U. S. Resettlement Administration, Land Use Planning Publication 14, 1937, mimeographed.

[19] The census of Agriculture reports that during the crop year 1929 some type of fertilizer or limestone was used on almost a million tenant-operated farms at a total cost of over 100 million dollars. There was also an expenditure of over 200 million dollars for feed during the same year. Both of these items add to the fertility of the soil, and the average of these two items per tenant-operated farm amounted to 397 dollars—enough to be of considerable importance in landlord-tenant relations. (See *Farm Tenancy,* Report of the President's Committee, pp. 50–51.)

Compensation for Improvements and Penalties for Deterioration. The amount which the landlord should pay the outgoing tenant for unexhausted improvements should ordinarily be agreed upon in advance.[20] The tenant should agree to keep a complete cost record of improvements he makes, so that the amount of his compensation at termination of the lease can be equitably determined. In case the landlord and tenant disagree on the amount of compensation, an appeal should be made to an arbitrative board selected by the parties concerned. This procedure should work out satisfactorily in most cases, though there will be instances when the temperaments, personalities, and characters of the two contracting parties may make satisfactory settlement impossible. Although there has been an increased tendency in recent years to incorporate compensation provisions in lease contracts, the practice is still not very general. Only the more farsighted landlords appear to have adopted this practice. Failure to use such compensation provisions more generally is an important factor accounting for some of the more significant shortcomings of farm tenancy in the United States, partly accounting for the low economic and social status of farm tenants in many sections.[21]

Many written leases specify that the tenant must treat the property in a good and proper manner, or return the farm in as good condition as when he first rented it, ordinary wear and depreciation of course being excepted. As a matter of fact, considerably more written leases contain this provision than provisions for compensation for unexhausted value of improvements made by the tenant. It should be added, however, that in cases where the farm deteriorates by wasteful or negligent practices, the only recourse available to the landlord is usually to terminate the contract. In more glaring or obvious cases, of course, the tenant can be sued in the courts; but the most serious types of deterioration caused by wasteful and negligent practices of tenants are so gradual and so difficult to measure for a single year that the landlord ordinarily does not find it easy to make a strong case against the tenant. Moreover, unless reciprocal provisions are incorporated in the lease contract to allow the tenant compensation for improvements, more liberal courts, at least, would not be inclined to consider the landlord's case in deterioration instances too favorably.[22]

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[20] Amount of compensation need not always be determined in advance. For a discussion of statutory regulations see Marshall Harris, Albert H. Cotton, and Rainer Schickele, "Some Legal Aspects of Landlord-Tenant Relationships," Iowa Agricultural Experiment Station Bulletin 371, April 1938; and Iowa State Planning Board, *Report and Recommendations of the Farm Tenancy Committee,* Des Moines, Iowa, October 1938.

[21] Studies conducted in various parts of the United States substantiate census data which indicate that homes of tenant farmers have fewer fixed conveniences of all kinds than homes of owner farmers, but that tenant's homes are much more like those of owners with reference to movable equipment. (Cf. Margaret G. Reid, "Status of Farm Housing in Iowa," Iowa Agricultural Experiment Station Research Bulletin 174, September 1934; and "Some Factors Affecting Improvement in Iowa Farm Family Housing," Iowa Agricultural Experiment Station Bulletin 349, June 1936.)

If many of the more glaring evils of farm tenancy in the United States are to be removed, lease contracts must contain provisions for compensation to tenants for improvements, as well as provisions for penalties for deterioration.

Although it is difficult in most cases to estimate in dollars and cents the economic and social costs and the losses which grow out of tenant insecurity of occupancy, a survey in southern Iowa and northern Missouri reveals a significant relationship between a rapidly shifting tenancy and a highly exploitative farming system. For example, this survey found that "on farms operated for one to two years by the same man, 42 per cent of crop land in corn and an erosion rating of 4.3 were found, as compared with 30 per cent in corn and an erosion rating of 2.8 on farms for 31 or more years under the same operator."[23] The larger percentage of crop land devoted to corn on tenant farms occupied for short periods would logically be expected. Tenants with year-to-year leases find it diffi-

[22] The Report of the President's Committee on Farm Tenancy lists four important reasons why, in spite of statutory provisions, common-law rule, and contractural stipulations, a large proportion of tenant operators' farms not only are unimproved but are allowed to deteriorate year after year, until the soils are seriously depleted and eroded, and buildings and fences dilapidated: (1) A large proportion of landlords are interested in their farms only as temporary sources of income or for speculative gain; (2) much deterioration is so gradual and so difficult to measure for a given year that the landlord finds it difficult to make a case of deterioration against the tenant; (3) many tenants are negligent about maintaining the farm in its original condition, to say nothing of improving it, because they are not assured that they can continue their occupancy; and further, they know it is improbable that they will be held responsible for deterioration; (4) tenants realize they will receive no compensation for any improvement added to prevent deterioration. (See *Farm Tenancy*, Report of the President's Committee, p. 52.)

[23] See Rainer Schickele, John P. Himmel, and R. M. Hurd, "Economic Phases of Erosion Control in Southern Iowa and Northern Missouri," Iowa Agricultural Experiment Station Bulletin 333 June 1935 p 214

cult to develop an effective system of farming which involves much livestock production, or land uses like permanent pasture, alfalfa, or similar hay crops necessary in dairying and beef cattle production.[24] It is apparent, in the interests of maintaining and improving the productivity value of agricultural lands, that farm ownership by operators should be encouraged, or landlord-tenant relationships adjusted in the direction of more security of occupancy for the tenant, accompanied by reasonable assurance of realizing the benefits of utilizing soil conserving practices and receiving compensation for improvements made.

Remedies for Non-payment of Rent. When granting possession and control of his land to another, the landlord is ordinarily protected in his right to receive payment for such temporary surrender of control, and the foregoing of benefits which he might have secured from personal operation of the land. Such protection usually arises in legal form from the *right of distress, the right of attachment,* or the *landlord's lien.*[25]

As a remedy for non-payment of rent, the landlord can take and hold under the right of distress any goods and chattels found upon the land, if by such action he does not cause undue hardship on the tenant. The right of distress exists in the United States in a number of areas, particularly in the East, although in some areas distress has become impersonalized and the approved remedy is identical with or closely similar to the ordinary process of attachment. A statutory lien upon crops or chattels has come to be the most common remedy for non-payment of rent.[26]

Kinship Between Landlords and Tenants. Where tenants are related to the landlord, farm tenancy may serve as a desirable working arrangement when the father or father-in-law or relative is retiring from active operation of the farm and the son or son-in-law or relative is assuming full responsibility. Nearly a fifth of the tenant farmers of the United States are related to their landlords, being brothers, sisters, children, or grandchildren of their landlords, or married into the landlord's family. The percentage of tenants related to their landlords is comparatively low in the South and the drier portions of the Great Plains, where many farms are quite new. In the South, it is lowest in areas where colored farmers are most numerous. In many northern counties in Wisconsin, Minnesota, Nebraska, Kansas, and Utah, more than two-fifths of the farm tenants are related to their landlords.[27]

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[24] It takes many years to build up a good dairy or beef herd, and the silo, stables, and other equipment necessary in livestock production. In addition, livestock herds cannot be liquidated quickly without the risk of considerable financial loss. Consequently, tenants with short leases do not ordinarily find it advisable to engage in dairying and beef cattle production, and their farms become eroded because of excessive cropping to cash crops like cotton, small grains, and corn, and depleted in soil fertility because of the absence of considerable numbers of livestock to provide manure. (Cf. *Farm Tenancy,* Report of the President's Committee, pp. 52–53.)

[25] *Loc. cit.*

[26] Some 29 states have adopted the statutory lien, including all southern states and most of those in other areas of high tenancy. In general, the law fixes definitely the amount of lien to which the tenant is subject, and the length of time for which it is valid. Ordinarily the language of the lien restricts its operation to the current year's crop. In the southern states, the landlord's lien for rent is usually attended by a statutory lien for advances and supplies. In such cases, these liens are usually balanced by the mechanics' lien, which aims to assure the cropper of payment for his labor. (*Loc. cit.*)

It has been observed generally that tenants who are related to their landlords are more inclined than other tenants to use farming practices aimed at conservation of the land and maintenance of improvements, because many of the related tenants expect to become owners, and many of them work under general supervision of their landlord. This is not always the case, however, and there are numerous examples of depleted farms operated by one of several heirs, who has the task of obtaining the consent of three or four brothers and sisters in distant cities before he can turn a hand in operating the farm. Moreover, despite kinship, the landlord may have only a transitory interest in maintenance of soil fertility and upkeep of improvements, because he looks forward to early disposition of the property by sale.[28]

Another important aspect of kinship between landlords and tenants is the fact that when farm estates are settled, a great deal of farm wealth is transferred to cities, because many of the children or relatives have migrated from the farms. O. E. Baker has estimated that from 3 to 4 billion dollars were drained from farms to cities by inheritance during the decade 1920–1930.[29] The division of the farm property among the heirs of deceased farm owners tends to require the farm operator, who may be one of the heirs, to buy out the other heirs at prices often above strict market values, or necessitates his sharing the annual returns from the farm each year with the various heirs who have an interest in it. This aspect of inheritance or transference of property through decease places a heavy burden on the farm, through the necessity of practically repurchasing it every generation.[30]

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[27] H. A. Turner, "Graphic Summary of Farm Tenure," U. S. Department of Agriculture, Miscellaneous Publication 261, December 1936, pp. 2–3.

[28] *Farm Tenancy,* Report of the President's Committee, p. 47.

[29] O. E. Baker, "Rural-Urban Migration and the National Welfare," *Annals of the Association of American Geographers,* vol. III, June 1933, pp. 59–126.

Characteristics of U. S. Farm Tenant Families. Some of the economic and social effects of farm tenancy as it has operated in the United States can be seen from an analysis of the characteristics of tenant families. One of the arguments advanced for farm tenancy is that it is an important rung in the ladder leading to farm ownership. Consequently, if it is effectively serving this function, the average age of tenant farmers should be appreciably younger than that of owners. Facts show that tenancy is much higher among young farmers than among older farmers, but it is significant to note that in recent years tenancy has increased among farmers of every age group, indicating that with every decade it is becoming increasingly difficult for farmers to climb the so-called "agricultural ladder" to the ownership rung.

The average annual net income of tenants in the northern and western states is not particularly different from that of farm owners, while in the South the tenant incomes are considerably lower than those of operating owners.[31] Studies in several midwestern states reveal that tenants spend about as much for family living as full owners, and that part owners generally spend a little more than full owners. In these areas, the soil is generally productive, and tenancy is on a comparatively satisfactory plane. Consequently, the level of living of tenants probably does not seriously handicap them in their social, educational, and religious activities and relationships. However, tenants have costs of moving which owners do not have or do not have so often, and these in the aggregate are appreciable.[32]

Tenancy is generally more prevalent in the highly commercialized farming areas, and the proportion of products produced on the farm used by the farm family is considerably less in tenant families than in owner families. This means tenant families purchase a considerably higher proportion of their food than owner-operator families, and it is acknowledged that, generally, foods purchased lack many of the important health qualities of the fresh fruits, vegetables, meats, and dairy products produced on the farm. The lack of gardens on tenant farms is mainly a matter of insecurity. This situation undoubtedly has an important bearing upon the health of farm tenant groups compared with that of owners.

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[30] For a recent study of some aspects of this problem, see E. D. Tetreau, "The Location of Heirs and the Value of Their Inheritance: Farm and City Estates," *Journal of Land and Public Utility Economics*, vol. XVI, no. 4, November 1940.

[31] For a more adequate treatment of planes of living and incomes of tenant and cropper farmers on southern plantations, see A. F. Raper, *Preface to Peasantry*, University of North Carolina Press, 1941; and T. J. Woofter, Jr., *et al.*, "Landlord and Tenant on the Cotton Plantation," Work Projects Administration Research Monograph 5, 1936.

[32] J. T. Sanders, "Economic and Social Aspects of Mobility of Oklahoma Farmers," Oklahoma Agricultural Experiment Station Bulletin 195, 1929, p. 3; and W. D. Nicholls, "Farm Tenancy in Central Kentucky," Kentucky Agricultural Experiment Station Bulletin 303, April 1930, p. 152.

Studies of the health of tenants have been limited largely to prevention of malaria, hookworm, venereal disease, pellagra, typhoid fever, and related health conditions. In certain localities in the South, findings indicate a close correlation between the level of education of the people and their incomes and standards of living. Tenant and cropper families, because of their smaller incomes (averaging less than half that of owner-operators in the southern states) can afford less for medical care and are generally at a disadvantage in combating disease.[33]

Tenant families are generally at a disadvantage in regard to education and literacy, because of their relatively great mobility. Studies indicate that children of less frequent movers make more rapid educational progress per school-age year than those of more frequent movers, and that excessive mobility of tenant farmers is important in hindering proper educational development and utilization of educational facilities.[34] Participation of farm tenants in religious activities is ordinarily lower than that of owners. Tenants also show a lack of interest in or failure to participate in community and group activities and cooperative enterprises, largely as a result of their high mobility and insecurity. These characteristics have serious implications because many improvements in the economic and social status of farm tenants can be achieved most effectively through local cooperative effort and group participation.

Arguments for Farm Tenancy as a Form of Land Tenure. The unfavorable aspects of farm tenancy, revealed by landlord-tenant relationships and characteristics of tenant families in the United States, should not be considered as a blanket condemnation of farm tenancy per se. Tenancy of the right type is a useful and important institution in many ways; but, like many other institutions, it has bad features as well as good, depending upon the conditions surrounding it.

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[33] For a more detailed analysis of the problems of health in tenant groups, see the various studies cited in *Farm Tenancy*, Report of the President's Committee, pp. 58–59.

[34] Sanders, *op. cit.*, p. 41; Nicholls, *op. cit.*, p. 176; and J. O. Rankin, "The Nebraska Farm Family," Nebraska Agricultural Experiment Station Bulletin 185, February 1923, p. 28.

A Stepping Stone to Farm Ownership. Tenancy has played an important role in the welfare of American farmers, and in the growth of agriculture. The tenancy system has enabled young and inexperienced farmers to begin as tenants when they lacked the knowledge or capital to assume the responsibilities and hazards of farm ownership. As a rung in the ladder to ownership of agricultural land this is one of the most useful aspects of tenancy as a form of land tenure. But how much tenancy is necessary to fulfill this function properly? Naturally, if there is too little tenancy, it will be impossible to have an uninterrupted movement up the ladder from the status of laborer to tenant to part-owner to owner.[35] The effect of too little tenancy is quite similar to that involved in climbing a ladder on which one of the rungs is missing or placed much further up the ladder than the previous rungs. On the other hand, if there is too much tenancy, the effect is to jam up a large proportion of the farm operators on a particular rung, or a group of rungs spaced close together, making it difficult for them to move on up to ownership.

A working hypothesis set up in the late twenties was that 30 per cent tenancy is perhaps about the right amount to give young farmers a chance to climb the agricultural ladder from the status of hired laborer, through tenancy and mortgaged owner debt, to the free ownership of land.[36] There are 27 states in which farm tenancy does not exceed 30 per cent. There are 16 states where the percentage of tenancy exceeds 40 per cent, and 9 of these are cotton states. The others are midwest or Great Plains states. There are two cotton states (Georgia and Mississippi) with 60 per cent tenancy or more.

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[35] The agricultural ladder refers to the steps through which a farm operator passes in attaining farm ownership. In some cases, through inheritance, purchase, etc., the operator begins farming as an owner; but the great majority of farm operators who become owners begin either as laborers or tenants. Some jump from the status of laborer to that of owner, or laborer to part-owner, skipping the tenant rung, but it is most usual to proceed from laborer, either on the home farm or a neighbor's farm, to tenant, to owner, and in many cases an intermediary step—namely, part-ownership.

[36] H. C. Taylor, "What Should Be Done About Farm Tenancy?" *Journal of Farm Economics*, vol. XX no. 1, February 1938, p. 145.

Consequently, tenancy is not too great in most of the states to prevent it from fulfilling its important function in the agricultural ladder. In Denmark, farm tenancy is about 5 per cent, and is considered too little to give many aspiring farm youths opportunity to achieve farm ownership.

Farm More Closely Approximates Optimum Size. Another important argument for tenancy as a form of land tenure is the fact that with the customary practices of credit institutions and the rationing of capital which farmers are permitted to hire in the capital market, a tenant farmer who does not have to tie up a large portion of his capital in the form of land, as do owners, may be better able than an owner to operate a farm unit more closely approximating optimum size. With prevailing farm prices, interest rates, and rental rates, Schultz found that when a corn belt farmer with restricted assets goes from tenancy to ownership, economic effects are either (1) lower rewards to the farmer and his family for their labor and management inputs, or (2) higher costs reflected in higher prices for farm outputs.[37] In other words, if a farmer is not allowed to secure the use of as much capital as is necessary to permit him to add resources up to the point where marginal cost equals marginal revenue, the average cost per unit of output is necessarily increased, or the best combination of production factors is not achieved. If a farmer has a given amount of capital, a significant portion of which must be tied up in land at the expense of other operating capital, this result is very likely to occur. The landowner may have a higher social status in the community which ownership bestows, and he has the "privilege" of large prospective windfalls and losses; but too frequently ownership is bought at the expense of returns to the farmer and his family.[38]

Tenants have an advantage over owner-operators wherever they can secure farm lands in sufficient quantity and quality at reasonable rental rates to make efficient use of their larger operating capital. In many northern and western areas, tenant farms average appreciably larger than owner farms, and in these areas the process of capital rationing works to the advantage of tenants. In the South, however, because of the existence of certain racial, economic, and social conditions, tenant farms are much smaller than owner farms, and this advantage in favor of tenancy disappears. There are other disadvantages of current rental practices, such, for example, as the lack of compensation for improvements made by the tenant, which tend to offset and in many cases to outweigh the unfavorable implications of ownership incurred in usual capital rationing practices.

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[37] T. W. Schultz, "Capital Rationing, Uncertainty, and Farm Tenancy Reform," *Journal of Political Economy*, vol. XLVIII, no. 3, June 1940, p. 317.

[38] *Loc. cit.*

The disadvantages of ownership noted tend to encourage farm tenancy, particularly with increasing mechanization of agriculture. To offset this, adjustments must be made in farm credit practices to allow owner-operators to acquire sufficient capital to achieve as effective combinations of land and other production factors as are now achievable by tenants who do not have to allocate a considerable portion of the limited capital available to them to land purchase.[39]

Miscellaneous Advantages of Tenancy. Other less important advantages of tenancy include: (1) providing the farmer a temporary arrangement or opportunity to become thoroughly acquainted with the farm before purchasing it, if for any reason he doubts the desirability of the particular place he has in mind for purchasing; (2) providing a period of apprenticeship for an inexperienced farmer under an experienced landlord; (3) providing convenient alternatives for those who have become owners and who for one reason or another cannot or do not desire to operate their holdings directly.

Arguments Against Farm Tenancy. Arguments against farm tenancy grow largely out of the character of the landlord-tenant relationships which have developed in the United States. In this young pioneer capitalistic nation, where rugged individualism and ruthless exploitation of natural resources have predominated, and where land has been treated much the same as any other economic good, there has not been the proper culutral attitude or regard for the land by either landowner or tenant, on a plane commensurate with its proper status as a storehouse of life, requiring careful husbandry for continuing productivity. Too often the landlord's ownership or intent of ownership of a given farm is quite transitory. He may not be a farmer or interested in agriculture as such and may have acquired a farm through inheritance, or for speculative purposes, or by foreclosure of a mortgage, and may be looking for an opportunity to sell the place advantageously at his earliest opportunity. Under these conditions, the tenant's outlook is uncertain, and this influences his management plans and his attitudes toward making improvements and conserving the soil. This general environment, which has been so prevalent in the American economy, combined with failure to utilize more generally such contractural and related devices as compensation for improvements and written rather than verbal leases, has been largely responsible for unsatisfactory farm tenancy conditions in the United States.

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[39] Essentially, the farm credit adjustments which would be required would involve granting landowners more total capital than tenants, on grounds that the land is complete security for the loan against it and does not detract from the amount of capital which can be reasonably loaned the operator, as an operator. Most credit agencies, particularly the Federal Land Bank, insist that their loans be based both on the man and the land. Lending agencies are adopting more scientific methods of appraising, and the amounts loaned are being based primarily upon security represented by the land itself, regardless of the operator. Although the establishment of farm credit practices based upon the land as the sole security for the loan tends to impersonalize farm credit, it is apparent that something along these lines must be done if landowners are not to be penalized at the expense of tenants.

Americans generally have come to regard tenancy as a social disease and an inferior form of land tenure compared with ownership, The notorious conditions associated with farm tenancy in the South have also contributed to the disrepute in which farm tenancy is generally held. Moreover, Americans are inclined to overlook the fact that the alternatives are not farm tenancy or farm ownership, but farm tenancy or a larger quota of hired men and indebted owners.[40]

Status of Farm Tenancy in Europe. Evidence that farm tenancy under the right conditions has many advantages in an economy can be seen from the social esteem in which it is held, and its importance and meaning in Europe. In many European nations, farm tenancy has been the pacemaker of agricultural progress and is regarded as a sound and necessary component of the tenure system.[41] It has been recognized in many of these nations that in times of depression the position of tenant is often superior to that of owner-operator; and in England the function of the landlord as a shock absorber is widely appreciated. In other nations, the most striking instances of poor tenancy conditions have been improved by various agricultural reforms effected after the First World War.[42]

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[40] Black and Allen, *op. cit.,* pp. 402 ff.; and Spiegel, *op. cit.,* p. 61.

[41] Spiegel, *op. cit.,* p. 62.

[42] Spiegel indicates that at present there are no farm economists in Europe who would generally and unconditionally condemn farm tenancy. (See *ibid.,* p. 62.)

Tenancy has been used as a means of land settlement in various countries, including England, Italy, Holland, Estonia, and Yugoslavia. In general, the policy in land settlement programs in European nations has been to establish a state tenantry from whose prosperity the whole community would profit.[43] Some European nations have developed over many decades a body of practical legislation and administrative arrangements which have eliminated most of the major evils associated with farm tenancy in the United States. Undoubtedly one of the prerequisites for achieving the necessary legislative and administrative arrangements to make for more satisfactory farm tenancy conditions is the basic concept that tenancy has an important role and a proper place in an economy, and that ownership of the land by every farm operator is not necessarily a desirable goal. In those nations where tenancy has been so acknowledged, and clear-cut tenant rights established, the greatest advancements have been made in establishing satisfactory farm tenancy.

Objectives of Farm Land Tenure Policies. It would be an overstatement to say that an improvement in land tenure policies alone could be expected to stabilize American agriculture, or to change habits of ruthless exploitation into habits of conservation. It would not be an overstatement, however, to say that the effecting of policies which would make for greater security of occupancy would contribute greatly toward such ends.

During recent years, American agricultural policy has apparently involved three major objectives: (1) conservation, (2) adjustments to bring about a better balance between agriculture and industry through parity prices, and (3) help for the underprivileged classes. Obviously, if the major objective of agricultural policy is to help underprivileged classes, it would seem that the position of the farm tenant in the United States would be strengthened, enabling him to become an owner, or landlord-tenant relations so improved that many existing economic and social evils associated with farm tenancy would be removed.

The improvement of the position of farm tenants might involve programs and activities conflicting with another current objective of American agricultural policy—that of securing a better balance between industry and farming. More diversified southern agriculture, to be achieved by shifting large cotton acreages to other crops, is considered basic to any fundamental improvement in conditions of southern tenants and sharecroppers. This worries Middle West farmers, because of the prospective increase in competition which might result from this more diversified agriculture. Also, if tenant conditions are improved appreciably, their farms should be more productive, and in many cases the tenants would stay in agriculture rather than shift to other occupations. These developments would tend to offset or work against the objective of bringing agricultural production more nearly into line with demand conditions, so that farm prices will be more on a par with industrial prices. Widespread unemployment, and the lack of alternative economic opportunities in industry in the thirties, however, encouraged improving conditions of tenants, many of whom are involuntarily forced to remain in agriculture.

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[43] *Loc. cit.*

Activities to improve the condition of farm tenants fit in well with the third major objective of American agricultural policy—conservation. If changes can be made so that the farmer can secure compensation for his improvements and can look forward to a considerable period of occupying the same farm, he will be encouraged to follow those management practices which maintain and improve soil productivity. In this respect, conservation and tenure policies can be said to be complementary, as well as compatible with each other.[44] However, the student of land economics should keep in mind the fact that conservation cannot be achieved through laws, or a tenure system, but only by the establishment in the mind and spirit of the farmer of a proper culture or philosophy of life and use of the land. Just as laws cannot make people good, but can tend to strengthen the tendency of people to behave in their dealings with their fellow men, so can tenure laws and customs help bring about conservation of the land, even though they cannot create the spirit of conservation itself.

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[44] Cf. Spiegel, *op. cit.*, p. 3. Spiegel goes on to say that it is doubtful, however, whether the land tenure policies propounded so far in the United States will ever result in that degree of conservation which the European peasant applies to his land. European peasantry is preserved by tariff fences and receives prices much higher than those received by American farmers, with the result that, since the government conserves the peasant, it need not conserve the land. Conservation on American farms could be achieved by subsidization of increased consumption of farm products through such devices as the food stamp plan or the two-price system, which would have important economic advantages over the present policy of subsidizing curtailed production in the guise of soil conservation, characteristic of the AAA and related programs. Spiegel adds, however, that while the European peasant is financially able to practice conservation because of the high price of agricultural products secured for him through tariff fences, restrictions on the alienation of land, on its devisability, inheritance, and utilization tend to confirm the peasant in his conservation practices.

In a nation as commercialized as the United States, it is logical to assume that if a tenure system can be established which will assure farm tenants of securing rewards for their conservation practices, a considerable amount of conservation will be effected; but the rewards of conservation practices are frequently intangible or deferred, and unless fundamental reforms in land tenure can accompany provision for compensation for improvements, American farm tenants may not be inclined to undertake conservation practices which may be most desirable in the long run. Fundamental changes in land tenure, together with restrictions on the alienation of farms, and related adjustments which are probably essential for an effective conservation program of a continuing and permanent nature, require a fundamental change in the traditional attitude, thinking, and culture of American farmers. In Europe, present attitudes toward conservation, which are so much in contrast to those in the United States, are the result of ancient traditions.

Economic Foundations for Farm Tenancy Reform. The actions of public bodies in pursuing farm tenancy policies designed to improve tenant conditions can be justified on strictly economic grounds, as well as on social or other bases. Individual farm operators are largely concerned with the private net product of their actions, and they attempt to equalize the values of marginal private net products of resources which they utilize in their farming operations. There is no tendency, however, toward equalization of the values of the marginal social net products, unless the marginal private net product and the marginal social net product are identical.[45] When there is a divergence between these two types of marginal net products, the self-interest of the farm operator will not, therefore, tend to make the national dividend a maximum, and as a result certain definite acts of interference with normal economic processes may be expected, in order to increase the national dividend.[46]

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[45] Cf. *ibid.*, p. 69.

[46] This is the argument advanced by Pigou in his *Economics of Welfare.* Pigou states: The marginal social net product is the total net product of physical things or objective services due to the marginal increment of resources in any given use or place, no matter to whom any part of this product may accrue. . . . The marginal private net product is that part of the total net

Those types of primitive contracts between landlords and tenants in which nothing is said concerning the condition of the land at the end of the lease or about compensation for improvements tend to maximize the difference between the private and the social net product. In other words, the contract merely provides for the return of the land to the owner at the end of the lease, in whatever condition it may be at the time. Thus, the difference between the private and social net product amounts to almost all of the deferred benefit which would be conferred upon the farm through any improvements made; but, as Pigou points out, the private net product is not less than the social net product by the whole of this deferred benefit, because a tenant who is known to leave the farm in good condition is likely to secure farms through leasing more easily and on better terms than one who is known not to do this. To this extent, good tenant farming yields an element of private as well as social net product.[47]

Programs to Improve American Farm Tenancy. The widespread belief in the advantages of land ownership in the United States has made public opinion particularly favorable to measures which facilitate ownership of farms by tenants. The most widely prevalent idea has been to make easy credit available to tenants, but obviously this is not always desirable. It too frequently results merely in exchange of an obligation to pay rent for an obligation to pay interest, combined with the added risks and vulnerability accompanying ownership. Unless the tenant can pay down a substantial part of the purchase price of the farm, permanence of occupancy may be less assured rather than more assured. Improved farm mortgage credit policies, discussed in the following chapter, would be of much benefit to many tenant farmers who are capable of responsible ownership and who would benefit by arrangements which would make it possible for them to purchase under more

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product of physical things or objective services due to the marginal increment of resources in any given use or place which accrues in the first instance . . . to the personal responsibility for investing resources there." (A. C. Pigou, *Economics of Welfare,* Macmillan, London, 4th ed., 1932, p. 172.)

[47] The practice in many European nations of making separate contracts, often at considerable intervals of time, makes this qualification practically insignificant. Pigou argues that compensation for improvements should be based not on the value of the improvements to an incoming tenant, but on the value to the landlord. (See *ibid.,* pp. 175 ff., for shortcomings of compensation schemes and their effects upon the relation of the private net product to the social net product.)

suitable conditions. The federal government, through its land bank system and the Bankhead-Jones Farm Tenant Act of 1937, is attempting to bring about significant improvements in farm credit.[48] Under the latter program, however, funds made available by Congress have been too limited to permit any significant large scale attack on farm tenant problems. Neither have adequate safeguards been established to prevent later speculation, higher land values, and accompanying increased tenancy. Under the Bankhead-Jones Farm Tenant Act, loans are distributed to the states on the basis of farm population and prevalence of tenancy, and within the states funds are distributed to counties by a state committee on a similar basis.

Among other proposals made in the United States to check the increase in farm tenancy is partial or entire exemption of homesteads (owner-operated farms) from taxation. Other suggested reforms in farm taxation to improve farm tenancy conditions are indicated in Chapter XVI. The Farm Security Administration, through its rehabilitation program, is supplying a combination of credit and technical guidance to numerous tenants who lack the funds or who are as yet unable to look forward to early purchase of a farm, even under the Bankhead-Jones Act. But many of these clients are building gradually up to where they may be able to climb onto the higher rungs of the agricultural ladder. Measures of one sort or another to prevent excessive speculation in farm lands, particularly in view of recent tendencies growing out of the war, would help to prevent heavy reversion of farmers from ownership to tenancy.[49]

In certain states, various laws designed to improve farm tenancy conditions have been passed but, for the most part, they fall far short of bringing about any extensive reforms or of securing adequate protection for tenants.[50]

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[48] The Bankhead-Jones Farm Tenant Act embodies advantages not hitherto available, including: (1) a rate of interest as low as 3 per cent, (2) a very small down payment, (3) 40 years for repayment on the amortization plan (which is not strictly a new policy), (4) local committees of experienced farmers to assist in selecting the farm and the purchaser, (5) authority for the government to require proper care of land and improvements, (6) provision against a second mortgage, and (7) withholding title for five years to prevent speculative sale. (Gray, *op. cit.*, p. 408.)

[49] Cf. *ibid.*, p. 408.

[50] Joseph Ackerman, "Status and Appraisal of Research in Farm Tenancy," *Journal of Farm Economics*, vol. XXIII, no. 1, February 1941, p. 277; and Spiegel, *op. cit.*, pp. 75–76.

The federal government has largely followed a policy of converting tenants into owners, or preventing reversion from ownership to tenancy. Efforts to improve the character of the tenant-landlord relationship, which is as important as converting tenants into owners or preventing increased tenancy, have been limited primarily to federal supervision of leasing arrangements of Farm Security rehabilitation clients. There is a great need for more effective federal and state legislation dealing with landlord-tenant relationships along the lines of providing compensation to tenants for improvements or for unwarranted and arbitrary termination of lease contracts, or for refusal to renew. In the end, such provisions should benefit both landlords and tenants. Certain constitutional difficulties and public attitudes retard more rapid development, but the trend seems unmistakable.

Gray indicates that an important gap in American land tenure policy is the lack of an adequate small-holdings program. The large number of stranded and migratory farm families drifting aimlessly about, looking for casual and precarious employment, should be rooted in the soil, for reasons of general social welfare.[51] Most of these people have farming experience and background and would prefer country living if they could have a dependable holding.

Farm Tenancy Programs in Other Nations. The following brief sketch of recent farm tenancy programs in selected nations points out the methods used and types of improvements effected in these nations. Although basic conditions affecting United States farm tenancy are different from those in other areas, there are nevertheless many lessons which Americans can learn from experiences and programs in some of the older areas.

British Farm Tenancy Reform. Improvement of farm tenancy in England, Scotland, and Wales has been based principally on revision of leasing arrangements. The more important of these changes have given the tenant the right to take movable improvements with him on termination of the lease, and to be compensated for the unexhausted value of other improvements he leaves behind; the right to receive compensation for disturbance; and the right to bring differences regarding right of compensation before arbitral committees.[52]

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[51] Gray, *op. cit.,* p. 409.

[52] For a more detailed analysis of British landlord-tenant relations, see Marshall Harris, "Agricultural Landlord-Tenant Relations in England and Wales," U. S. Resettlement Administration, Land Use Planning Publications

In addition to these improvements, Scotland has spent considerable effort to enlarge holdings, relieve poverty in heavily populated areas, and increase ownership for certain groups of operators.[53]

Farm Tenancy Improvement in Ireland. Improvement of the existing system of farm tenancy in Ireland was tried, but shortly abandoned in favor of a program to give tenants full title to the land through purchase. Farm tenancy in Ireland has been reduced from 97 per cent to 3 per cent since 1870.[54] This policy of purchase and resale to Irish tenants was adopted as a definite policy of the British Government with the passage of the Ashbourne Acts of 1885 and 1886; and passage of subsequent acts made possible the undertaking of a land purchase program on a large scale. By 1921, two-thirds of the area of Ireland had been brought under the land purchase acts. Money to finance this large purchase program was raised through issuing bonds at a low rate of interest. In general, the lands were taken over by the land commission, the occupiers either given title to their holdings or put on a purchase basis pending clearance of legal title to the lands. The repayment periods varied from 49 to 68½ years, and the interest rates from 2¾ to 4½ per cent per annum. The average price at which land sold ranged from an amount equivalent to 23½years' rent under the Act of 1870 to only 13¾ years under the Irish Free State Acts of 1923–1931.[55]

Under the 1870 Act, the tenant-purchaser was not allowed to alienate, assign, subdivide, or sublet his holdings as long as any part of his loan remained unpaid, but prohibitions against alienation and assignment were repealed in 1881, though subdividing or subletting holdings was forbidden throughout the entire purchase program.

German Farm Tenancy Reform. Because of a highly developed farm credit system, farm tenancy in Germany is not nearly as important as it is in many other countries, only about 10 per cent of all

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No. 4 and 4a, July 1936; also *Farm Tenancy*, Report of the President's Committee, pp. 72–74; and Spiegel, *op. cit.*, chap. V. This latter reference gives a particularly thorough analysis of English land tenure policy, including developments in connection with the British war effort beginning in 1939.

[53] For a more detailed statement of agricultural land tenure reform in Scotland, see Marshall Harris and Douglas F. Schepmoes, "Scotland's Activity in Improving Farm Tenancy," U. S. Resettlement Administration, Land Policy Circular, February 1936, pp. 13–21.

[54] *Farm Tenancy*, Report of the President's Committee, p. 71.

[55] *Ibid.*, p. 76.

land in farms and forests being rented.[56] However, there is considerable variation in tenancy in different parts of Germany. In 1933, the German government enacted the Entailed Farms Law. This law has entailed up to 25 per cent of all German farms, and 30 per cent of all farm land. On these is established a form of inflexible tenure in which the farms cannot be subdivided, sold, or mortgaged, and must be bequeathed undivided, according to entail, and generally according to primogeniture and inheritance rights, with provision for "next-in-line" inheritance. Farms under this act are also referred to as "inherited freeholds." To become an inherited freehold, a unit must range in size from about 18 to 309 acres, varying by regions, but the acreage must be large enough to support a family, and the owner must possess only one such unit.[57] The aim of the inherited freehold, or the German Entailed Farm Law of 1933, is to perpetuate the family-sized holding in the hands of a qualified member of the descendants of existing owners. Restrictions on subdivision, prevention of division among several of heirs, and restrictions on sale and mortgage to prevent it from being lost by its present owner or his lineal descendants are included.

Since 1920, a system of protection has been established in Germany which safeguards farm tenants against harsh eviction and the evils of rackrenting. This system of protection was necessary, not so much because of vicious tenancy conditions but as the result of currency inflation after the war, which disturbed landlord-tenant relationships. Landlords were forced to shorten the term of the lease, and frequently to change the amount of the rent, in order to keep pace with rapid declines in the value of money. Though intended to be of a temporary nature, protective legislation has been renewed from time to time, and special boards established, composed of one jurist and a representative of the landlords and the tenants, to adjust the rents to changing conditions, and to annul notices of eviction. Lease contracts on land of more than 5 acres, and all lease contracts on land belonging to an entailed farm, cannot be entered into without official permit, which is necessary for every sale of land as well as for agreements regarding utilization and transfer of land.[58] In 1937, a series of model lease contracts were prescribed for the three main types of tenancy[59] by the powerful Reich Food Corporation. Under the model contracts, the lease term has been greatly lengthened. The model lease contract also gives the tenant the right to claim compensation for improvements. Compensation is compulsory for improvement which, according to the principles of good husbandry, is a helpful amelioration like reclamation of waste and swamp land, change of grassland into cropland, and similar changes which increase output. The model lease contracts contain other provisions, including stipulations concerning the rent rates, and any deviation from standard conditions laid down in the contracts results in increases in or reductions of the standard rent.

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[56] In 1933, only 10.7 per cent of all land in farms and forests was rented. Excluding forest land, which is seldom rented, it was estimated that the agricultural land under lease amounted to 16.6 per cent in 1933, but as a matter of fact, almost 50 per cent of all German farmers rent some land. Fifty-one per cent of all German farmers own all of their land, and 41 per cent have farms composed of owned and rented land. Only 6 per cent of all German farmers are tenants proper. (Spiegel, *op. cit.*, p. 119.)

[57] *Farm Tenancy*, Report of the President's Committee, pp. 81–82; and Spiegel, *op. cit.*, pp. 122–123.

For the past half century the German Government has sponsored an almost continuous program to promote owner-operated farms among farm laborers and rural youth. Many owners who had farms too small for economical operations have been aided in obtaining additional lands, and in many cases large estates have been divided or sizable tracts of land have been reclaimed, and village-type settlements established. In recent years, a type of development intermediate between the closed village and the scattered farm type of settlement has been emphasized. Also, the average size of newly established holdings has risen considerably in an attempt to increase efficiency and output.

Danish Farm Tenancy Improvement. Denmark, by the end of the nineteenth century, had done much to increase the proportion of farmers owning holdings. By 1895, the proportion of all Danish rural properties operated by owner occupants was 87.4 per cent;[60] and with programs effected later, tenancy has been reduced to about 5 per cent.[61] Through cooperative action, individual farms, even though small, have been able to achieve much of the efficiency and many of the economies enjoyed by large estates, and the technique of group action acquired through these cooperative societies enabled farmers on small holdings to become an effective influence politically in securing legislation to improve their condition.

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[58] Spiegel, *op. cit.*, p. 127.

[59] The three model contracts are (1) those used for the temporary lease of an entailed farm, (2) those for that of another farm, and (3) those for the lease of parcels and tracts of land. (*Ibid.*, p. 129.)

[60] Elizabeth R. Hooker, "Recent Policies Designed to Promote Farm Ownership in Denmark," U. S. Resettlement Administration, Land Use Planning Publication 15, p. 2.

[61] *Farm Tenancy,* Report of the President's Committee, p. 71.

In 1899, the Danish Parliament passed an act which began a far-reaching program of farm tenancy reform. This law made provision for state loans to cottars (cottagers) for the purchase of small farms, a policy which had been adopted long before for the benefit of farmers having at least one *hartkorn tongue* of land.[62] In 1934, a law was passed dividing holdings into three types: (1) small holdings, (2) small farms, and (3) horticultural holdings. Acreages in each of these three types are required to be sufficiently large to afford adequate maintenance for a family without outside labor.[63] Suitable land for privately owned small holdings originally came largely from church properties and feudal estates, but land from these sources was exhausted in 1932, and must now be purchased from property on the market. An additional source of land for small holdings is obtained through reclamation (particularly drainage), much of the land in central and western Jutland having been brought under cultivation. Up to the present, the supply of land has been equal to the demand from applicants for small holdings. A very liberal credit policy regarding loans to successful applicants for each of the various types of holdings has facilitated increased ownership of farm operating units.

Certain limitations on the rights of possession have been placed upon occupants of state lands and on the owners of holdings subject to state loans. Among the most important of these—which are intended to safeguard the financial investment of the state, prevent speculation, and insure permanence of each small holding as a unit capable of affording adequate support for a family—are: (1) After the holding has been prepared and occupied, the acquirer is obliged to occupy and operate it, on penalty of having to repay the indebtedness in full immediately. (2) The small holders must maintain the needed livestock and equipment, and must keep the buildings in good repair and not undertake any operations, like excavations, which would destroy the surface soil, without special permission from the Minister of Agriculture. (3) He must allow official inspectors free access to the holding and remedy, within a period fixed by the Minister, any conditions regarding operation of the holding to which the inspectors object. (4) He must keep all buildings and necessary equipment insured against fire with a company recognized by the state, and insure his buildings against damage by storm, and his crops against damage by hail. (5) He must not sublet any part of the holding, on penalty of being required to repay his entire indebtedness at once; nor can he erect on the holding any house intended to be let to tenants. (6) He is forbidden to sell any part of the holding, or consolidate it with any additional land, without permission from the Minister of Agriculture. (7) He may not transfer his holding freely by will to anyone but a natural heir. (If there is no next of kin, the successor must meet the conditions required of small holders.)

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[62] The Danish measure of land known as the *hartkorn tongue* is that amount of land which will produce a given amount of grain. On the most fertile soils, only about 8⅓ acres are required to produce such an amount, and in Denmark as a whole, the average extent of a *hartkorn tongue* is 24.7 acres. This unit of measurement was long used in determining values of agricultural land for purposes of taxation. It has not been used in connection with state taxes since 1903, but was one of the factors in fixing local taxes up to 1926. (Hooker, *op. cit.*, p. 3.)

[63] Under the 1934 law, small holdings cannot be less than 7.4 acres, nor exceed, without special permission, 19¾ acres. Small farms may not exceed 37 acres of land of medium productivity, and horticultural holdings may be either market gardens or orchards, and need not meet the ordinary requirements as to minimum size. In addition to these three main types of holdings, still a further type of holding was established in 1933, subject to further provisions in the law of 1934. By the law of 1933, local government bodies might provide garden plots for unemployed persons, and in the 1934 act, emphasis was laid on the duty of finding land for garden plots in urban territory. The minimum limit of size for other holdings does not apply to garden plots. (*Ibid.*, pp. 8–9.)

Other Nations. Many nations, including Norway, Sweden, Egypt, Mexico, and others, have also made important changes in legislation to improve farm tenancy and land tenure.[64] In Egypt, during the last thirty years, agricultural land tenure conditions have been much improved through legislation which has equalized land taxes, increased the amount of cultivable land through irrigation and reclamation projects, and greatly enlarged and improved agricultural credit facilities. In Mexico,[65] the states have the duty of destroying the large plantations, because conditions in the different states are so varied that a general program is not feasible. Each state determines the extent of the area an individual may own. A date must be set before which the owner of an area in excess of that permitted by law shall be required to reduce his estate to the area allowed by law. This forced reduction in size of holdings is by means of expropriation proceedings, and the expropriated areas are sold under conditions stipulated by the state government; but the owners are required to accept agrarian bonds carrying 5 per cent interest to be redeemed in not less than 20 years, as payment for their expropriated land. During the period of amortization, the new purchasers cannot alienate their holdings. The purchasers pay to the federal treasury the amounts which the latter supplies on their behalf, and the settler is usually required to pay in twenty consecutive annual installments, including interest on the unpaid balance, which begins two years after first possession of the lands. Forests, pastures, and waters are always used in common. The lots into which tillable lands are divided are about 62 acres in extent, and can be cultivated only by the family, the employing of laborers directly or indirectly being prohibited. No person can have more than one lot and one building plot in an agricultural settlement. The states have also assumed the functions of developing small holdings by creating zones around the villages within which only small properties may be held. Local laws also govern the extent of the family patrimony, which may not be mortgaged or attached in any form.

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[64] For a brief statement indicating the changes effected in Norway and Sweden, as well as in Denmark, Germany, England, and Scotland, see Erich Kraemer, "Tenure of New Agricultural Holdings in Several European Countries," U. S. Department of Agriculture Special Research Report no. 2, September 1937.

[65] The statements concerning recent land reforms in Mexico are condensed from *Farm Tenancy,* Report of the President's Committee, pp. 85–86.

The preceding survey of recent programs to improve farm tenancy in the United States and other selected nations reveals that the ultimate land tenure system in most nations will be neither complete ownership by those who till the soil, nor a system that eventually results in reducing farm tenancy to a social status of peasantry based upon capitalistic farm enterprise. In the nations which have been most active in doing something about agricultural land tenure, three major tenure types have been proposed or adopted: (1) ownership, (2) tenancy, and (3) mixed tenure, or a form combining the elements of ownership and tenancy. On a number of occasions, land settlement laws for various reasons authorized the application of a variety of tenure types; but absentee, private, unrestricted ownership has not been created in any of the European nations discussed above, and restricted tenures have played an important part in their land settlement activities. In spite of repeated special efforts on the part of the English government to promote the use of ownership arrangements, practically all the English settlers have preferred to be settled as tenants of the county councils—that is, as public tenants; and in Scotland, the majority of the new holdings have been established on publicly owned land under restricted ownership of the rental holding type.[66]

The Future of Farm Tenancy. The use of restricted tenures has met with considerable success in many land settlement undertakings, in warding off important dangers such as the inefficient use or abuse of the land, undesirable subdivisions or enlargement, over-indebtedness, speculation, and similar undesirable developments. Obligations imposed on the owner in such matters as compensation for unexhausted improvements, determination of rent payments, and determination of the lease contract have done much to improve conditions prevailing under tenancy and mixed tenure. In the future, valuable results may be expected from the use of special arbitration and adjustment machinery to adjust outside the courts disputes between the contracting parties. Kraemer indicates from his study of selected European nations that further simplification of agricultural land tenure will take place in the future, by emphasis on mixed tenure, and he holds that instability of land tenure policies in the field of land settlement is likely to continue as long as the problem of finding an adequate pattern of landed property in agriculture remains unsolved.[67]

In the United States, there has been a growing tendency, particularly during the depression thirties, to encourage a larger proportion of the population to live on farms. Although national policy is somewhat confused and indecisive, the general intent on new holdings, made available principally through irrigation, seems to be to have units of an adequate size to support a family. However, legislation adequate to curb effectively both speculation and many of the evils associated with complete freedom of disposition of landed property has not been enacted. The necessity of developing opportunities for considerable numbers of unemployed may arise in the coming years, and an adequate small-holdings program may be developed. Efforts to diversify agriculture in the South, accompanied by efforts to enable tenants to become owners, along the lines of the Bankhead-Jones Farm Tenant Act, may substantially reduce the percentage of farm tenancy in the United States in the years ahead.[68]

It is not likely, however, that the percentage of farm tenancy in the United States will be reduced below that proportion required for most effective operation of the agricultural ladder system, although the disrepute in which farm tenancy is rather universally held in the United States may cause public opinion to swing to extremes in efforts to encourage farm ownership to the point where many who may not be ready for or capable of assuming responsible ownership may be encouraged to become owners, with resulting reduction of the general welfare. Programs to improve landlord-tenant relationships should parallel programs seeking to convert tenants into owners. Special efforts will have to be made to secure sufficient appreciation of the place of tenancy in its right forms in the economy, if any significant improvements in landlord-tenant relations are to be effected.

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[66] Kraemer, *op. cit.*, p. 79.

[67] *Ibid.*, p. 80.

[68] County committees under the Bankhead-Jones Farm Tenant Act have received many applicants for each loan they could make under the terms of the act, indicating the widespread interest in this program to increase farm ownership. (Cf. Spiegel, *op. cit.*, p. 89.)

It would seem that for the next few years, in the United States at least, greater improvements in the farm tenancy situation can be made by improving the character of the relationship of tenants and landlords, rather than in any wholesale attempt to convert tenants into owners. The achievements of some of the older nations along these lines, particularly those arrangements dealing with compensation for unexhausted improvements and compensation for disturbance, should furnish a good guide for improving American landlord-tenant relationships. At the same time, however, such desirable adjustments as more scientific assessment and taxation of farm lands, or more adequate and sound land valuation and credit policies, and reform of the land transfer system to incorporate some of the better points of the Torrens or some similar system (see the next two chapters), together with related adjustments encouraging farm ownership, should not be overlooked. These programs can effectively improve the agricultural land tenure system of the United States and make American agriculture more attractive and prosperous.

FOREST LAND TENURE

Tenure problems in forest land are concerned primarily with public versus private ownership, rather than with the division of property rights between owner and occupier (tenancy) as in agricultural land, or among various private owners, as shall be seen in the case of water rights. Private ownership is held largely responsible for forest devastation and deterioration on the grounds that, because of the nature of forestry as an industry, it is less effective in maintaining the forest resources than public ownership.[69] Many students of forest economics recommend the increasing acquisition of forest lands by the federal government and a systematic plan of reforestation and development on these lands. Others contend that it is not public acquisition that is needed, but a higher degree of social control in the interests of the general welfare. Many would concede that some systematic plan of resource use in the interests of the general welfare could have prevented much of the social wastes and losses of unrestricted exploitation.

Advantages of Public Ownership. The growing of forests and the kind of care required to maintain forest productivity are long-time propositions which require for most effective operation programs and activities which may not show any significant return for many decades. Ordinarily, private capital is not anxious to undertake such ventures because of the piling up of investment in standing timber at a relatively high rate of interest. It is more interested in types of investments where returns will be more quickly received. Another argument for public ownership is that forestry is a large scale proposition running into hundreds of thousands of dollars on single operating units. The development of the modern corporation has made it possible for private individuals to secure the amount of capital necessary to operate such large-scale businesses, so that this is not an insurmountable difficulty. However, combined with the type of risk which forest production involves, the size or scope of operations does tend to discourage private investment. Still another advantage of public ownership is that public lands are tax-free, and high taxes are one of the principal causes of the present difficulties of private ownership and operation. At the present time, the federal government gives 25 per cent of the direct gross revenues from national forests to the state treasurers and to the counties in which such national forests are located, to be spent by the counties for schools and roads. However, such contributions are quite different from tax assessments on private lands. Contributions vary with the amount earned from the national forests, and are consequently flexible. On the other hand, tax assessments on private land are based on assessed valuation of the real estate (land and trees) and are comparatively rigid.

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[69] Of the 83 million acres of devastated or poorly stocked forest land, 74 million (nine-tenths) are privately owned; and of the 850,000 acres devastated annually, about 95 per cent are in private hands. It is further estimated that fully 95 per cent of the private cutting is probably made without any conscious regard for future productivity, while nearly all the cutting on publicly owned forests is designed to perpetuate the forest. (See "A National Plan for American Forestry," U. S. Sen. Doc. 12, 73rd Congress, First Session, Government Printing Office, 1933, p. 12.)

Another advantage of public ownership is that the federal government, state, or county agency can devote a considerable amount of funds to developing scenic and recreational forest values without the necessity of making these activities pay a profit. Private owners cannot afford to put in a considerable sum of money for developing trails, campsites, and similar facilities for the benefit of tourists or vacationists unless they are reimbursed for such activities. As yet, the policy of paying for the right to camp or picnic, particularly in forested areas, is not established. Most citizens feel free to use such facilities without paying for them, and public agencies have developed many facilities for the free use of these lands by vacationists. tourists, and others. The same situation holds in regard to the development of hunting and fishing facilities.

Fire burns over more than 40 million acres of U. S. forest and potential forest land annually,[70] and records show that the cost of providing fire protection, based on the burn record, is very high in some areas, costs in the Pacific Coast and northern Rocky Mountain area averaging between 5 and 7 cents per acre.[71] These high costs make it very difficult for private owners to protect their forest lands adequately.

The Clarke-McNary Act, passed in 1924 by Congress, provides for a federal appropriation of 2½ million dollars a year for fire protection in cooperation with private owners and state governments. Many argue that public aid for forest fire protection to private owners is not efficient, and that complete public ownership would be necessary to reduce burning to a minimum. They point out that the ratio of actual burn to allowable burn averages 11 for the areas outside national forests and only 1.07 for the areas within national forests. A ratio of one or less indicates a satisfactory condition.

Similar conclusions in regard to the advantages of public ownership have been reached by students of forest economics in connection with protection from insects and forest tree diseases—that is, that public agencies are in a much better position to give the attention and funds necessary for adequate protection, while private owners are not able to protect their properties, or at least do not do so adequately.

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[70] This is the average for the period 1926 to 1930. (*Ibid.*, vol. II, p. 1400.)

[71] *Ibid.*, pp. 1057–1058.

Federal Ownership of Forests. The national forests are an example of federal ownership and administration, and demonstrate what can be accomplished by this means. National forests, first called "forest reserves," were established in 1891 by an act of Congress which provided that the President might from time to time set apart as public reserves public land bearing forests, whether of commercial value or not, in any state or territory having such land; and that the President by public proclamation should declare the establishment of such reservations and the boundaries thereof. The forest reserves were placed under the jurisdiction of the Department of Agriculture in 1905, and in 1907 the name was changed to "national forests" as being more descriptive of the fact that they contain a variety of resources whose greatest possible value to the public lies in management which will integrate the development and use of these resources for the largest possible net public benefit. Under this theory of management has been worked out a program benefiting the local population contiguous to the national forest area, by the annual payment of a fourth of the gross receipts to the counties to help defray the costs of schools and roads. Federal expenditures for roads in and adjacent to the national forests have also contributed much to local employment and local payrolls, so that local areas first prone to oppose the establishment of national forests, on the grounds that their taxable resources would be reduced, have almost universally come to be the strongest supporters of such a program.

The major part of the present national forest area is of poor timber stands, or inaccessible, since private owners had acquired the choicer timber land under the public homestead and other laws. Most of the public land available since 1891, when the first national forest was created, has been located in the mountainous portions of the West. Even in the western country, however, private ownership had acquired significant areas within what have later been established as areas within the national forest boundaries. Moreover, the checkerboard land grants made by the federal government to aid the railroads created many private holdings within present national forest boundaries. In addition to these private holdings, there are within the national forest boundaries private lands obtained under mining and townsite laws, and agricultural homesteads in the narrow valleys running up into the national forests or situated in the surrounding timbered areas.[72]

In addition to the federally owned forest lands in the national forests, there are approximately 9 million acres of forest land on Indian reservations under the jurisdiction of the forestry branch of the U. S. Indian Service. There are also more than 4 million acres of forests in the national parks, which cover about 8½ million acres, and more than a million timbered acres in the approximately 4½ million acres included within the 38 national monuments. Of the remaining public domain, more than 23 million acres of unreserved and unappropriated federal land are classified as forest land, although only a fifth of this supports a stand of commercial timber.

The passage of the Weeks Law in 1911 marked a definite step toward national ownership and operation of forest lands. This law provided for the acquisition of forest lands by the federal government for the protection of the flow of navigable streams. The Clarke-McNary Act extended this policy to lands within the watersheds of navigable streams necessary for the production of timber. Under these acts, national forests have been created east of the Mississippi River (except those created from the public domain in the states of Michigan and Florida). Figure 39 shows that there is a very small acreage in the eastern two-thirds of the nation. This reflects the slow growth of national forest areas by federal purchase.

Management and Use of National Forests. The dominating thought in the management and use of the national forests is to balance the multiple uses against each other in such a way that maximum public benefit will result. Frequently this means excluding some use, or reducing in intensity the particular use in order to enable a more intensive or more widespread appropriation for other uses. Wherever it is possible, by suitable compromise, to enable two or more uses to occupy a given area, concessions are made by each. For example, timber cutting on watersheds is usually permitted, but regulated to avoid impairment of the watershed value. Or, timber growing and livestock grazing may use the same area, as long as the grazing does not prevent or unduly damage forest reproduction. Selective timber cutting may proceed with very little, if any, interruption of the non-concentrated forms of recreational utilization of the forest. Properly administered, the national forests constitute a large variety of overlapping uses so harmonized as to avoid any significant conflict—for instance, timber sale cutting, water supply for domestic irrigation and power uses, livestock grazing, game conservation, and recreation. This harmonizing has been more complete in some areas than in others; in any case, the principle of controlling the extent of various uses to prevent serious conflict among them is definitely established.

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[72] Consequently, while there are 186,215,256 acres of land within the national forest boundaries, 24,854,565 acres are in ownership other than federal, leaving 161,360,691 acres of federally owned national forest lands. (*Ibid.*, p. 569.)

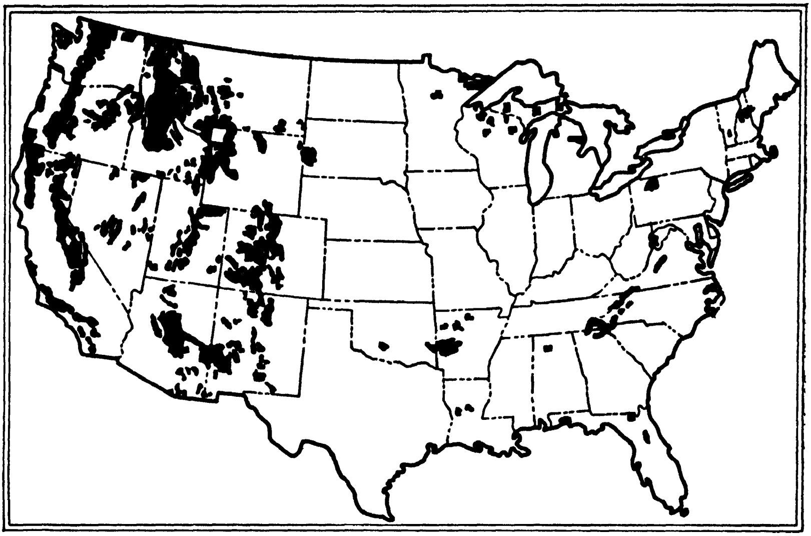

FIGURE 39. National Forests of the United States. (Source: *Forest Land Resources, Requirements, Problems, and Policy,* National Resources Board, Government Printing Office, Washington, D. C., 1935.)

The record of the Forest Service in the U. S. Department of Agriculture is, in general, excellent. Its policy of harmonized multiple-use coordination through enlightened management and expert service in the public interest has definitely established it as one of the better administered federal programs. Timber management plans on the national forest are built around the principle of obtaining a steady, continuous yield of wood products best suited to the public need, so as to contribute the maximum to stabilizing industries and communities wholly or partly dependent on operations based on national forest stumpage. The disposal of national forest timber is controlled by formal statements of policy which define the markets to be served, the policy for the sale of the timber, and the general silvicultural methods for the private buyer to follow in cutting. Disposal has been controlled in such a way that the annual cut has been kept well within the sustained-yield capacity of the national forests.

Although limited by inadequate funds, national forest replanting has contributed significantly to improvement of forest resources in selected cut-over areas. It is estimated that at the current rate (between 25 and 30 thousand acres annually) it will take at least 70 years to catch up with the area of national forest land which requires replanting if it is to be restocked within a reasonable time. The Forest Service has maintained a policy of controlled range use of the forage within national forest boundaries, and has adjusted the amount of grazing to the carrying capacity, which is greatly influenced by weather conditions. The rather widespread drought in the western states in recent years, combined with other factors including needs of other forest uses, has brought about a reduction in the amount of stock permitted to graze on the national forests.

The work of the U. S. Forest Service in developing recreational values on forest lands, particularly in the West, is becoming increasingly well known. The thousands of miles of forest trails, the numerous campgrounds, and the related recreational facilities in forested areas are excellent examples of what may be done under public ownership and control without reducing the economic value of the forests or creating abandoned cut-over lands, unsightly scenes, and unstable industries. Similarly, in wildlife preservation and improvement (including both fish and game) the work of the Forest Service is an excellent example of the possibilities of making more complete use of forest lands.

Perhaps public ownership and operation have been most effective in the field of forest protection. Fire hazards, particularly in recent drought years, have been rather general throughout the western states and have increased in severity. Yet the practical and educational programs effected by the Forest Service have been important in keeping fire losses to a minimum. The control of forest insects and tree diseases in the national forests has been much less outstanding than that of fire protection, largely because of the lack of adequate funds to meet these problems.

State Ownership of Forests. State lands consist largely of lands granted to the states by the federal government, principally for the support of schools, or tax-reverted lands and lands acquired through gift, exchange, or purchase. It is significant that three of the seven leading states in state forest land acreage are the cut-over Lake states of Michigan, Minnesota, and Wisconsin, and that two others in the first seven—Washington and Idaho—are in the cut-over areas of the Pacific Northwest, where tax reversion has been large. This is further evidence of the breakdown of private forest land ownership and the trend toward abandonment of cut-over lands by private owners. In 29 states title reverts to the counties or towns in tax forfeiture proceedings, so that the amount of state-owned forest lands in some states would not reflect the extent or trend of forest land tax reversion. In these 29 states, as well as in several of the others, the acreage of state forest lands represents principally acreages which were received through federal grants to the states.

Millions of acres of land unsuited for agricultural use, which have been cut over and cleared of forest growth, are awaiting return to public ownership. Some steps have been taken by federal agencies to purchase certain areas of such lands under a varied program of acquisition, but a large acreage is still left to be rehabilitated by the state in which it is located. For the most part, ownership and management of the smaller blocks of from ten to a hundred thousand acres, which are too large for smaller local governmental units to handle, must be assumed by the states themselves.[73]

County Ownership and Management of Forests. County governments become owners of forest lands principally through failure of private owners to pay taxes assessed. In two states—New York and Wisconsin—encouragement has been given to the county forest movement by special legislation providing for state participation in the expense of operating county forest lands. In New York, the legislature provides for other contributions up to $5000 per year to any county for land purchase, reforestation, and protection.[74] Title is vested in the county, but state law provides that the area must be forever devoted to watershed protection, production of timber and other forest products, and recreation or related purposes. Lands owned or acquired by the county under these provisions are exempt from state and county taxes. The board of county supervisors may sell trees, timber, or other forest products from the county forest lands, upon terms considered to be for the best interests of the county, and under rules and regulations prescribed by the State Conservation Commission.

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[73] All but 9 of the 48 states now have state forests with a total area of about 13½ million acres, divided into 732 units. (U. S. Department of Agriculture, "State Forests for Public Use," Miscellaneous Publication 373, Government Printing Office, pp. 1–2.)

Nearly a half million acres of tax-reverted lands have been blocked into county forest units. The Wisconsin Forest Crop Law of 1927 was amended in 1929 to permit the counties to list tax-reverted land as "forest crop land." For every acre of land listed, the state pays 10¢ each year to the township in which the land lies, to be divided among the school districts, the town, and the county in a manner similar to private forest cropland payments. As a further encouragement, the 1931 Wisconsin legislature ordered the Conservation Department to pay the counties an additional 10¢ to be used for reforestation, administration, and maintenance under the supervision of the Conservation Department. Thus, every acre of county forest land in Wisconsin draws 20¢ of state money annually. When the timber is cut, the state receives 50 per cent of the stumpage value, four-fifths of which is restored to the State Forestry Department fund for further encouragement and development of county forests.[75]

Recommended Expansion of Public Ownership. Only a fifth of the forests of the United States are now publicly owned, but students of forest economics insist that this percentage should be increased. The National Resources Board, in its *Report to the President* in 1934, presented a recommendation by the United States Forest Service that the public forest land area should be increased from the current 180 million acres to 358 million acres, or practically doubled. This recommended increase is principally in national forests and state forests. These recommendations are the summarization of recommendations made by local land use planning, forestry, and conservation agencies.

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[74] "A National Plan," vol. I, p. 848.

[75] "Wisconsin Forest Crop and Woodland Tax Laws," Wisconsin Conservation Department, Madison, Wisconsin, 1938.

In the minds of many students, public acquisition offers the only sound and workable solution of the forest problem in areas: (1) where growing stocks have been wholly or largely depleted by destructive logging, fires, and other causes; (2) where profitable operation for timber production may be impossible or very difficult for private enterprise, but where public interest in watershed, wildlife, and recreation values can be served only by organized management; (3) where acreage might be operated profitably by private owners but the public need for recreation and related uses makes public ownership highly desirable; (4) where privately owned forest lands are so interspersed with existing public forests and public acquisition units that management and development would be facilitated by public ownership; (5) where lands are submarginal for agriculture and the highest and best use is for forestry and related uses; and (6) where stands of timber are likely to be exploited destructively in private ownership because of excessive overhead or operating costs and other reasons.

The interstate character of the dependency upon forest resources, and other benefits from the use of forest lands make it desirable that a large part of the acreage recommended for public ownership be owned and operated by the federal government through the Forest Service. This seems logical because many states which are the most important source of timber for neighboring states are unable to finance the entire or major portion of the recommended forestry program within their boundaries. The 60 million acre increase recommended for state forests by 1960 is believed to be a very liberal estimate of the ability of the states to finance desirable forest programs. The recommended increase of more than twice this number of acres for national forests reflects the widespread belief that the federal Forest Service is in the best position to finance and administer the forest development and maintenance program desirable in the public interest.

Forest Areas That Should Remain in Private Ownership. It is not only impractical, but probably undesirable for public agencies to acquire all of the forests of the country that should be under permanent productive management. Forests favorably located in relation to markets, with good growing conditions, and with growing stocks not seriously depleted by fire, cutting, and lack of silvicultural treatment, and not overburdened with taxes and interest payments on borrowed capital which cannot be readily liquidated (see the next two chapters), have a very good possibility of being so managed under private ownership that they can realize their economic and social potentialities, provided there is adequate industrial self-regulation or sufficient public control.[76]

Experience with private forestry in the United States indicates that under favorable conditions reasonable returns from businesslike management of forest lands are fully possible, and the public interest also may be well served. The qualifications noted indicate that continued private ownership is recommended for those areas on which private enterprise appears to have the best chance. Very little decrease in farm woodlots is recommended. For the most part, farm woodlots are a very satisfactory means of private ownership and operation of forest lands. They contribute, in most cases, to a more balanced farm operating unit. In certain local areas, however, public interest will be served better by placing groups of farm woodlots under public ownership, so that they may be used for public recreation, wildlife, watershed, and erosion protection and control, and as demonstrations of organized management of scattered holdings of timber in highly developed agricultural sections where premium prices for timber make it profitable to follow intensive forms of silviculture.[77]

Public Regulation of Private Forest Lands. Public regulation of private forest lands to prevent excessive exploitation and encourage sustained-yield management should constitute an important part of national forest policy. Along with such regulation should go greater public aid to private owners in protecting their forests against fire, insects, and disease; in forest credits; in more reasonable taxation; and in development of better production and marketing techniques.

A plan has been suggested by which private owners would retain ownership but the government would manage the forests, pay a proportion of the income to the forest owner at the time of cutting, and pay local governments a stated yearly amount in lieu of taxes for support of these local governmental units. This plan recognizes the fact that a large proportion of our forest land will continue for many years in private ownership, and it seeks to avoid interference with private property beyond what is necessary to safeguard the rights and welfare of the public. This plan may be considered one of public regulation which would secure all the advantages of public ownership and at the same time maintain private ownership. Public agencies would be responsible for enforcing sustained-yield management practices. Another important advantage of the plan would be that public treasuries would not be drained by enormous outlays for land purchase. Moreover, local governments would have a definite and dependable annual income with which to pay the cost of their services. However, the author of this plan states that it is not advocated as a general substitute for eventual public ownership of a large proportion of the nation's forest land.[78]

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[76] National Resources Board, *Report to the President,* p. 211.

[77] *Loc. cit.*

Forest Policies in Other Nations. Forest policies differ widely among nations, both in extent and method of public control over private forests. In practically every case, however, the accepted solution of the destruction resulting from unfettered private or commercial ownership and operation is some form of public intervention and public control, which is now practiced in nearly every civilized country of the world. Briefly, the essential features of forest land policies, taking foreign nations as a group, are as follows:[79] (1) Ordinarily, an owner is free to manage and utilize his forest as he pleases, so long as his utilization practices do not directly or indirectly injure others or the public welfare. (2) The public exercises sufficient control over forests, where destruction or mismanagement are said to result in injury to others, to insure that their protective functions (stream flow, sanitation, water conservation, holding of soil in place to prevent erosion, etc.) are not jeopardized. Since maintaining these protective functions requires a continuous forest cover, public policies frequently involve reforestation, or engineering improvement works, or even afforestation of hitherto non-wooded land, either by public agencies or by the owner. Except where reforestation is required by law, the public pays part or all of the cost and usually indemnifies the owner for any loss of income resulting from restrictions on the use of protection forests. As an alternative, the public may acquire the land, either at the owner's request or by condemnation. (3) Protection forests are classified as such by a governmental agency, upon the recommendation of some public body or upon application of interested individuals or groups after appropriate investigations and hearings.

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[78] W. N. Sparhawk, "A Possible Program of Public Regulation," in "A National Plan," pp. 1343–1353.

[79] "A National Plan," vol. I, p. 1037.

(4) Cutting in classified protection forests can be done only with permission of competent public authorities. Methods of cutting and utilization of forage and other products are specified in some detail, either by law or through regulations promulgated by the supervisory authority. Reforestation of cut-over areas is compulsory. (5) The object of public control over forests other than protection forests is generally not to compel owners to produce any particular kind or quantity of material, but to insure that the land will be kept in a productive condition. Sustained-yield management is usually not required, and a minimum of control is exerted over methods of management and utilization on privately owned forest lands not classed as protection forests. The public holds definite mandatory powers, however, to prevent destruction of non-protective forests; but it attempts to bring about good management, largely through education and cooperation with the owner. (6) Public control in many nations is democratized and decentralized by vesting general supervision in local or provincial boards or commissions on which forest owners, technicians, and administrative officials—and in some instances the local population—are represented. Some of the very small nations have only one central commission for the entire country.

Future Forest Land Tenure. The need for some form of public regulation or control of timber cutting in commercial forests of the United States is generally conceded, but there is not complete agreement as to the best method to follow. A recent report draws the following conclusions: "No one knows how effective the states will be in preventing future destructive practices, nor does anyone know how satisfactory federal legislation would be. Pertinent considerations regarding the control of cutting include these: It is not so difficult to move in the direction of public ownership and control as it is to reverse the process; the implications of Federal control are far-reaching; the efficiency of financial aid in stimulating adequate state regulation has never been tested. For these reasons, it would appear wise for us to make a fair trial of Federal financial aid to states which will undertake the control of cutting. If this fails, then it may be necessary to place increased reliance on Federal control and public ownership and management of forests to insure adequate and sufficient supplies of timber."[80]

There are some who feel that the above conclusions are inadequate and that more definite steps should be taken at once toward increased federal control and public ownership. There are others, however, who feel that by making adjustments in the forest land tax system along the lines of taxing the land annually and the timber only when it is cut, and preventing future destructive practices through state legislation and state programs, the necessity for greatly expanded public ownership can be avoided. The arguments on both sides should be considered very carefully in working out a future forest land tenure policy. Certainly where state or local governments or individuals will undertake to do the job, every effort should be made to effect the necessary adjustments through these channels.

RECREATIONAL LAND TENURE

Two major types of tenure problems are associated with the use and development of recreational lands, dividing responsibility and control (1) between public and private ownership and (2) among public agencies—that is, among local, state, and federal bodies.

Public vs. Private Ownership and Control of Recreational Lands. Many forms of recreation are outside the field of public action. However, public regulation of private or commercial recreation and public provision of recreational services are increasing. Many forms of private recreational activity require public regulation in the interests of the general welfare, along the lines of preventing stream pollution, controlling billboards, and preventing private appropriation and exclusive use of resources in which the public has a definite interest. Open spaces and recreational facilities at minimum cost should be provided for the large groups who have neither means nor leisure to get out of the great industrial centers, since recreation for these groups is necessary for national welfare. Public bodies can also establish and maintain park areas and monuments. Private enterprise, by its very nature, cannot provide adequately for many of these services because (1) they require comparatively large outlays for development and maintenance, and (2) it is not desirable to charge admittance fees. Also, private enterprise is not well adapted to undertake the restrained use and continued protection and development from generation to generation which certain types of recreational land require for most beneficial use.[81]

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[80] "Postwar Agricultural Policy," Report of the Committee on Postwar Agricultural Policy of the Association of Land Grant Colleges and Universities, 1944, p. 47.

Since more than half the traffic over our public highway system is recreational traffic, it is important to develop trafficways with recreational value as well as efficiency for commercial use. To do this, some control over private lands on either side of the highway must be established. This may be achieved by outright purchase or by certain regulatory measures. To purchase such land, even for small distances on both sides of the highway, would be extremely expensive and unnecessary. Sufficient control can be established through such regulatory devices as zoning, which restrict the uses of lands lying along highways in regard to type, size, and location of billboards for outdoor advertising, size and distance from the highway of residences and industrial buildings, or similar activities. Some authorities insist that highway zoning should be part of the comprehensive zoning of an entire area or unit of government. Others feel that a 500–foot to 1320–foot strip on each side of the road is all that is affected by public interest and all that should be directly restricted by the state, chiefly on the basis of safety, general welfare, and esthetic principles. Many feel that the state should regulate the use of land along highways, because areas restricted are likely to be very spotty if such regulation is left to local units.

Another problem of recreational land ownership arises in connection with game animals. The preservation of certain big game animals is now considered the duty of the federal government—at least, federal agencies are active in this work. In the case of small game such as rabbits, squirrels, other furbearers, and upland game birds, no such clear-cut division of responsibility has been developed. The vast area of private farm land involved makes its utilization of major importance to this small game. Cultivation radically changes environmental conditions—in some cases, to the benefit of the small game, but frequently to their detriment. Farm operations provide abundant food and shelter for certain species during parts of the year, but too frequently they leave the game without these necessities at other times.[82] It would be undesirable, and certainly too expensive, for public agencies to buy strips of land throughout the farming areas of the nation, to provide food and shelter for small game during the winter. It is also unfair to expect the average farm operator to do much in the way of providing food and shelter at certain seasons. Not only does it cost him too much in time or money, but he has no established ownership or control right in the small game.

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[81] For a brief statement concerning the place of public and private recreational activity in a nation, see National Resources Board, *Report to the President,* pp. 217–221.

Public agencies can accomplish certain desirable results by establishing demonstration areas, but could probably do much more by promoting the establishment, through cooperative action, of practices which would best conserve small game in farming areas. These public programs might even provide for paying farmers small sums for such recommended practices. Roadside plantings in such areas as the Middle West have done much to furnish the shelter essential for nesting and for winter protection, but many areas are almost completely lacking in facilities to provide necessary food and shelter during severe winter storms. In Europe, hunting has been for centuries restricted largely to the nobility or the wealthy classes, who ordinarily assume direct ownership of the small game on their estates; but the traditional concept in the United States is that ownership of most game, whether on private or public land, is vested in state or federal governments, and that hunting, subject to restrictive laws and regulations (including those in regard to trespass), is for all who wish to indulge in it. Nevertheless a farmer is entitled to some monetary return proportionate to his efforts toward conserving the game on his land. He might be led to more active conservation by returns from the sale of shooting or trapping rights, under regulations fixed by the state. Hedgerows and bordering thickets often have a highly beneficial windbreak value. Restoration of hedgerows would in many areas have a beneficial effect on general use of the land. In the more arid and wind-eroded areas, strip cultivation to prevent soil erosion may also serve to increase or conserve farm game.

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[82] *Ibid.*, p. 225.

Recommended Increase in Public Ownership of Recreational Lands. There are selected areas throughout the nation which are submarginal for farming, and should be put to other uses. Some are in the national forests, and federal purchase of such lands, combined with resettlement of families on better areas and in more compact communities, would help to solve the game-protection problem and at the same time assist in getting the lands into their best use. A heavy drain upon wildlife resources is caused by the large number of submarginal farmers in forest areas where wild game is located who use wildlife resources rather freely, because of their economic circumstances and their isolation from law enforcement agencies. In addition to retiring submarginal farms in the national forests and resettling on better areas the families involved, the federal government should purchase certain essential winter range areas amounting to some 6 million acres within and adjacent to the national forests. Other selected areas should be purchased to expand the system of public wildlife refuges.[83]

Although expansion of the land area devoted to wildlife conservation is an important phase of developing the nation's recreational land resources, a well balanced national recreational program should be the concern of municipalities and their immediate environs. The major problem is to provide places for active recreation and enjoyment within easy reach of inhabitants of these large cities. This means including in urbanized areas adequate and properly distributed play areas for children and adults, in the form of small landscaped parks and playgrounds and, in the case of large cities, a few comparatively large parks. Recreational areas in most American cities are very inadequate and underdeveloped, and far below the minimum standard (one acre to every 100 persons) recommended for municipalities of 8000 inhabitants or more. For example, a city of 16,000 should have 160 acres of recreational land, 1/3 to 1/2 of which should be play areas of various types. Too many cities have only one or two parks of 5 or 10 acres, while the children of many neighborhoods have to play in vacant lots or, lacking these, in the streets. Some cities have spent far too much on spacious, beautiful cemeteries in comparison with what they have spent and are spending on recreational areas. This policy of taking better care of the dead than of the living may be short-sighted. Additional acreages should be acquired by municipal and county governments—and in some cases by state and federal bodies—to provide playgrounds and parks for the populations of metropolitan regions.

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[83] *Ibid.*, pp. 150 and 226.

This increase of public ownership at the expense of private land is recommended because, for certain types of recreational land development and use, federal ownership and control are considered more effective in the public interest than private ownership and operation. However, federal agencies have consistently followed a policy of supplementing private recreational services or developing recreational facilities where private development has been inadequate, rather than competing with private recreational facilities which are already serving the public adequately. For many types of recreational land, private development and operation are adequate especially in certain areas; and here private ownership and operation should continue. In the aggregate, such services are extremely important in fulfilling the recreational needs of the nation, although public regulation may be necessary to prevent abuses and private gain at the expense of the general welfare. For example, one of the most important problems in connection with private recreational land is premature development and resulting overexpansion, and poor land use. Some kind of public regulation or control over rate of use or settlement is essential in such cases, if these disastrous consequences are to be reduced or eliminated.[84]

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[84] A good example is valuable lake shore property. Wehrwein and Parsons found that more than half of the 16,000 registered lots in 3 northern Wisconsin counties, subdivided during the period 1902 to 1930, were laid out between 1923 and 1928. Each of these 16,000 subdivisions had to be carried on the tax rolls as a separate taxable description, and when the boom collapsed, over 9,000—more than ⅗ of all these lots—remained unsold and became tax-delinquent. The cost of advertising and selling these delinquent lots was more than the counties received in taxes on the rest of the plots. (G. S. Wehrwein and K. H. Parsons, "Recreation as a Land Use," Wisconsin Agricultural Experiment Station Bulletin 422, 1932, pp. 19–20; and Ely and Wehrwein, *Land Economics*, pp. 348–349.) This speculative development in private recreational land indicates the extent to which the private search for profit causes overexpansion and premature subdivision.

Division of Responsibility for Recreational Land Administration Among Public Agencies. The division of responsibility for effective development and control of recreational lands among various levels of government is a serious problem. Provision of "in-town" park, playground, and related recreational areas is primarily a municipal responsibility or, where the city covers almost the entire county, a city and county problem. This does not mean that other agencies, particularly state and federal governments or local governments like the town or township should not help to create and develop such recreational facilities; these agencies can do much to support and sponsor educational programs for the development of an interest in such projects. However, city officials must take the lead in initiating, developing, and administering them.

Local Government Responsibilities. Most city governments have been very slow to accept responsibility for furnishing "in-town" recreational areas. In too many cities, development has been unplanned with the result that many sites most convenient and useful for playgrounds, parks, and related recreational use have been developed for private residences or commercial use. Even if certain areas have been set aside for recreational purposes, leadership or supervision may not have been provided.[85]

Distribution of responsibility for provision of parks, playgrounds, and related recreational areas for metropolitan regions outside city boundaries is a more complex problem. Some cities have acquired parks well beyond their borders. Counties, special metropolitan park districts, and states may all serve as agencies for providing metropolitan parks; and the federal government, without any particular plan, has established recreational areas of various types within metropolitan regions. However, there is yet no definite policy with respect to division of responsibility among the agencies involved, nor are there any specific standards regarding the area, types of recreation to be established, or administrative methods used. The state may well accept a considerable measure of responsibility for the large outer zone parks, while the metropolitan park board or the county may function satisfactorily for parks in the inner, more heavily populated zones.

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[85] Out of 6000 towns and cities in America, only 1204 (approximately one-fifth) reported recreation under leadership. In 75 per cent of those reporting parks, the park acreage is below accepted standards. (See U. S. Department of the Interior, *Yearbook*, National Park Service, Government Printing Office, 1939.)

State Government Responsibilities. In outlining a program for state governments in recreational land policy, the following is recommended: (1) that state recreation system be based upon comprehensive surveys by qualified persons; (2) that factors to be considered in selection of areas include (*a*) unusual or unique natural features, (*b*) scenic quality, (*c*) probable adequacy of obtainable lands for expected kind and quantity of recreation, (*d*) variety and quantity of active recreational yield, (*e*) probable ability to produce legitimate income, (*f*) location with respect to population and to competitive areas, and (*g*) relative significance of historic, prehistoric, or scientific values; (3) that any outstanding natural features be included completely within the boundaries, and that a satisfactory year-round habitat for wildlife be furnished; (4) that adverse types of occupancy or use near recreational properties be prevented by the use of scenic easements; (5) that all values involved be carefully considered in determining kinds of public use to be encouraged; (6) that intensive uses be limited to one location or, at best, a small number of locations; (7) that state administrative agencies be equipped to render advisory service on the recreation problems of political subdivisions of the state; (8) that part of the cost of operating state recreational holdings be borne by users on a fee basis; (9) that a liberal portion of the total area in every state park be left completely undisturbed, free from roads, and with only a limited amount of trails. Several other recommendations in addition to these are included in the recommendations of the Board.[86] Similar considerations are suggested in the case of development of state forest and game lands.

Responsibilities of the Federal Government. The federal government is now providing and will undoubtedly continue to provide much of the recreational land area available for public use. Preservation of outstanding scenery and historical or archeological sites of national importance is properly a responsibility of the federal government, and in recent years this agency has done much to preserve and develop such recreational lands. Many historic and archeological sites and scenic areas are not limited to one state. The construction of parkways, involving improvement of scenic beauty along great trunk highways, involves expenses and legal difficulties which can more easily be handled by the national government. The complex problems and extensive areas associated with wildlife management and conservation (particularly in the case of migratory waterfowl) and the administration of great national park areas are best handled by the federal government.

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[86] National Resources Board, *Report to the President,* p. 218.

Adequate management of big game on the national forests presents particular difficulties because, while the Forest Service is in general charge, states in which forests are located claim jurisdiction over the game. The legal status of game on nationally owned lands has never been definitely settled. Under the present system of divided authority, it is difficult to work out an effective system of administration and conservation; but state game commissions, even when most competent, are obviously unable—subject as their policies are to changing political expediency—to equal the efficiency of the federal government, whose activities can be extended to national forests under federal plans of coordinating all forest uses.[87]

Aside from developing and administering specific types of recreational land which involve either extensive area, interstate legal problems, or special technical difficulties, the recreational activities of the federal government should largely supplement state and local, public and private recreational programs, rather than compete with or replace such services. For the most part, federal agencies have followed this policy; but in some cases federal recreational programs have been pushed to the point where they have competed with or eliminated desirable forms of recreation furnished by other public or private agencies. In the last analysis, the federal government should furnish a well-coordinated recreational land use program cooperating with state and local public agencies and private individuals and organizations to bring about increased interest in and better use of recreational land. Only through such democratic development and widespread public use can recreation be a vital force in a nation where it takes such a variety of forms as it does in the United States.

MINERAL LAND TENURE

Society's major problem arising from the peculiar nature of mining and minerals is conservation or wise use of these exhaustible and non-replaceable resources. In general, the United States has followed an "open door" policy of rather free individual exploitation under private initiative; and this has been associated with waste and depletion of many important minerals.

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[87] *Ibid.*, p. 223.

Sale and Leasing of Public Domain Mineral Lands. Many areas of the more than one billion acres of public domain land disposed of to private individuals contained mineral resources, but federal policy has usually been to allow private owners securing title to these public domain lands to exploit minerals found, unless the deposits were discovered prior to the disposition of such lands. It is quite easy to designate land as principally useful for farming, grazing, or forestry; but how can the existence, extent, or commercial value of mineral deposits be ascertained? Even after these problems are solved, there is still the question of the policy to follow in disposing of or in utilizing mineral lands. The Northwest Ordinance of 1785 (which dealt with the public lands of the Northwest Territory) reserved to the federal government one-third of all gold, silver, lead, and copper discovered. In 1796, an act was passed providing for the sale of public lands northwest of the Ohio River, and reserving all salt springs and licks to the federal government.[88]

These provisions, made early in the history of the United States, indicate that Congress intended to treat mineral resources differently from agricultural or forest lands. A policy of leasing gradually came to be followed. In 1800, Congress authorized the Surveyor General to lease reserved saline lands, and in 1807 extended the lease provisions to include lead mines on the public domain of Indiana territory. In 1816, leasing of public domain mineral lands was made general, by the indirect method of forbidding mining on public lands without approval of the President.[89] With the exception of opening lead mines and lands in Missouri to sale in 1829, the policy in regard to minerals on public lands was one of reservation and lease till 1846, in which year the Government embarked upon a new program of sale after the President's report that the reservation and lease program had proved unprofitable and unsatisfactory to the lessees. This policy of sale, inaugurated in Arkansas, Illinois, Iowa, and Wisconsin lead mines, was extended to other areas soon afterward, and to coal mines in 1864.[90]

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[88] Hibbard, *A History of the Public Land Policies*, p. 512; and C. J. Hynning, "State Conservation of Resources," National Resources Committee, 1939, p. 37.

[89] Hynning, *loc. cit.*

Discovery of gold in California, in 1848, led to a change in mineral land policies on the public domain. By 1866, nearly a billion dollars in gold and silver had been produced from western public lands in accordance with local customs which came to be recognized by courts and legislatures. In that year, Congress recognized and validated equitable rights acquired in accordance with such local customs, and provided that mineral lands of the public domain should be free and open to exploration, occupation, and acquisition, in general conformity with established local customs. Thus (with the exception of coal, which remained under the policy of sale and purchase established in 1864) mining law in the United States usually followed the rule of "possessory occupation."[91]

The principle of sale and purchase was extended in 1872 to mineral lands generally, and the mining act of May 10, 1872, amended the 1866 act by constituting mineral lands a distinctive class subject to special conditions of sale and set prices specifically applicable to mineral lands.[92] This principle of sale and purchase was based upon the general theory that anyone has a right to keep minerals in such lands. This wide-open door policy has been one of the major reasons why United States mineral production has been so difficult to control. In 1914 Congress revised the leasing system by passing a coal leasing law for Alaska; and, in 1917, Congress extended the policy to potash on all public lands of the United States. In 1920, a general leasing law for coal, oil and gas, phosphate, oil shale, and sodium was passed. This was extended in 1927 to cover sulphur; and the principle of leasing was also applied to gold, silver, and mercury to be reserved in certain existing land grants.[93]

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[90] National Resources Board, *Report to the President*, p. 421. President Polk reported in 1845 that although more than a million acres of public lands had been reserved from sale and numerous leases made, only some $6000 were collected for the years 1841 to 1844, while administrative expenses were $25,-000, and the mines were carelessly and wastefully worked. On these grounds, President Polk recommended abolishing the lease system and placing mineral lands on the market, for sale on terms approved by Congress. (Hynning, *loc. cit.*)

[91] National Resources Board, *op. cit.*, p. 421.

[92] The 1872 act provided for survey and sale of mineral lands, fixing the price of placer lands at $2.50 per acre, and lode claims at $5 per acre. (Hibbard, *op. cit.*, p. 517.)

Numerous federal acts passed during the history of the United States dealt with minerals on the public domain, recognizing two main types of mineral deposit—metalliferous and non-metalliferous. Generally speaking, metalliferous mineral deposits may be acquired in fee under the lode or placer acts, and non-metalliferous deposits may be developed under lease. Metalliferous mining claims may be filed on the remaining unappropriated and unreserved public lands, on areas in the national forests, and on some of the 35 million acres disposed of with reservation of mineral rights to the United States.[94] The maximum acreage that may be included in any single permit or lease, in the case of non-metalliferous minerals like coal, oil and gas, phosphate, potash, sodium, sulphur, and oil shale, is usually 2560 acres (four sections).[95]

Metallic minerals are substantially unaffected by any mineral conservation program of the state governments, and even in the case of the mineral fuels the problem has been largely economic rather than conservational. The urgent need has been for governmental intervention to stabilize mining operations by preventing or controlling surplus production and plant capacity.[96] The authority of the states to act under the police power gives them great opportunities to conserve their own resources; but in only a few cases has mineral conservation been a definite policy, and in most states the problems have hardly been considered at all.

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[93] National Resources Board, *op. cit.*, p. 421.

[94] In the case of lands in Indian reservations, the Secretary of the Interior may lease any part of the unallotted lands within such reservations in the states of Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Washington, or Wyoming, in the case of both metalliferous and non-metalliferous minerals, except oil and gas. This procedure was established by act of June 30, 1919, and amended December 16, 1926, to provide for the collection of 5 per cent of the net value of mineral output as royalties. (*Ibid.*, pp. 419-420.)

[95] No person, association, or corporation may hold coal, phosphate, or sodium leases or permits aggregating more than 2560 acres in any one state, or more than 7680 acres in any one state under oil and gas lease or permit. The original lease term is usually 20 years, with provision for renewal by successive ten-year periods. These leasing laws apply to unreserved public domain and to national forests (excluding the lands reserved under the Appalachian Forest Act, which may be leased under a special act) but do not apply to parks and monuments (see *ibid.*, p. 420).

[96] It is significant that the 19 investigations or hearings before Congress or by specially created commissions between 1913 and 1935 were largely concerned with price and labor problems of the coal industry rather than conservation of coal resources. (Hynning, *op. cit.*, p. 42.)

Petroleum as an Example of Tenure Problems in Mineral Lands. Oil is one of the best examples of private exploitation of a major mineral resource to the point where U. S. reserves are dangerously low in face of prospective increased demands.[97] The owner of oil land does not own the oil in his land, but owns the right to capture and appropriate oil from the common pool through wells drilled on his land. As a consequence of this peculiarity of ownership and lack of capture regulations in the oil industry, destruction and waste of United States oil resources have been excessive.[98] Among the essential needs of the oil industry is the development of a standard of individual ownership rights, so that every owner will participate in a just proportion of the reservoir content, and preservation of ownership control,[99] perhaps through some form of collective tenure or group control like that developed in grazing districts In order to do this, unit operation of oil pools (the opposite of the present wasteful competitive development of pools) would have to be introduced. By unit operation is meant development of a whole geologic unit according to a definite program supervised by the state, with royalties to be shared by the individual owners on the basis of acreage, oil in place, or some generally equitable arrangement, regardless of the location of producing wells.[100] Accompanying unit operation should be establishment of certain minimum engineering standards by state and federal regulatory bodies; and restrictions on abandonment of old oil wells as long as they are still in a state of production should accompany unit production. Abandonment may occur because of physical circumstances, or because of economic difficulties in the industry.

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[97] For an analysis of this problem, see John Ise, *The United States Oil Policy,* Yale University Press, 1926.

[98] Earl Oliver, "United States Oil Industry," in C. K. Leith (ed.), *Elements of a National Mineral Policy,* The Mineral Inquiry, New York, 1933, p. 141.

[99] Oliver also lists as essential needs: (1) balancing supply and demand so that oil production and consumption will be brought into reasonable balance, and (2) securing the greatest possible recovery of oil at the lowest cost. (*Ibid.*, pp. 145–146.)

[100] Effective unit operation obviously requires compulsory pooling of operating and leasing interests. Voluntary unit operation schemes have demonstrated that they are inadequate for the achievement of major gains in oil conservation on a nation-wide or state-wide basis. Advantages of compulsory unit operation are considered so great that England provides for cooperation among lessees of a geological unit to be effected voluntarily, failing which the government (through the Board of Trade) has the power to require unit operation subject to the right of arbitration. (Glenn E. McLaughlin, "Proposals for Petroleum and Natural Gas Conservation," in "Energy Resources and National Policy," p. 216.

Premature abandonment of producing wells because of economic changes may be limited by regulatory measures. Restriction of production to current needs might be accomplished by federal determination of production quotas for each state, and state allocation of these quotas. Proration on the basis of allocated production quotas may result in operating wells at much less than their most efficient rate, although many geologists say that pinching down the production of oil wells increases final oil recovery. The best way to stabilize the oil industry is to control drilling so that oversupplies and extreme price fluctuations can be avoided.

Unless some such arrangement can be established voluntarily by owners and operators with a minimum of government regulation, government ownership and operation will be necessary to prevent the continuation of wasteful exploitation of a very limited, irreplaceable, and useful resource. It is significant that complete nationalization of all oil rights in the United States, in line with the procedure followed by Germany and other nations, has been discussed from time to time in Congress. The federal government has acquired the important helium reserve in the Texas Panhandle by outright purchase. In many states, courts have already modified the rule of capture so that the landowner can recover only a certain portion of the oil within a given period.[101]

Recommended Future Mineral Policies Concerning Public and Private Ownership and Control. In spite of the fact that the open door policy of private ownership and exploitation followed in the United States on most mineral lands has been an important factor in the serious economic and social problems associated with the mining industry, and in spite of the many arguments in favor of public ownership of mineral lands, the 1934 report of the National Resources Board's Committee on Mineral Policy did not recommend general extension of public ownership of minerals now in private hands, with the exception of purchasing and retiring part of the coal reserves and some submarginal coal mines, and retaining tax-reverted mineral deposits in public ownership until the minerals are needed, when the deposits should be leased and royalties paid to the government. The committee states, "Whatever the abstract merits of public ownership may be, private ownership is so inherently a part of the American genius and tradition, and is so firmly entrenched, by law and custom, as a national policy, that the practical difficulties alone of any general reversal of the status quo at this late date would appear insuperable. However, future conditions cannot be foreseen, and the committee recognizes the possibility that restoration to public ownership of minerals now privately owned may sometime become a desirable feature of national policy."[102]

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[101] For a more complete analysis of proposals for petroleum and natural gas conservation, see *ibid.*, pp. 214–236.

The Committee defines the limits of public control as those included within producing and marketing cartels, or codes, duly modified to protect the rights of the producer, of labor, and of the consumer, strictly and impartially administered in the public interest by the federal government, and supplemented where needed by use of the state police powers to prevent waste in mining.

Mineral Policies of Other Nations. Relatively few nations follow the American open door policy in utilizing their mineral lands. The degree to which the door to unrestricted private exploration and exploitation is closed extends through a wide range, from compliance with a few simple regulations in some nations to absolute prohibition of mining by certain classes, in others.[103] In Canada, exploration and exploitation are carried on through a system of license and lease, traceable largely to the fact that mining rights exist or had existed in favor of the Crown. A fundamental characteristic of Canadian mining laws is that development, once projected, must be pursued, particularly on state lands. Most mining laws are based upon the theory of concession, prospecting in almost all countries being free and open to citizens or aliens, with regulations restricting the class of individuals who can engage in prospecting. Such regulations prohibit prospecting by impecunious persons, but would not ordinarily affect activities of any well-organized company. Africa is nowhere freely open to prospecting. For example, in Portuguese possessions ownership of mineral right is vested in the state, and the government may restrict prospecting rights on any land. Egypt claims exclusive ownership of all mineral substances and will not sell or grant term leases on them. Petroleum is subject to preemption or preferential purchase. Foreigners operate on the same basis as subjects if they have secured licenses or leases from the proper governmental agency or office. In the Transvaal, mining is not free and open, and no land can be prospected until declared open by the Ministry of Mines. In Guiana, the government has a prior right to oil, and in both Northern and Southern Rhodesia, mining rights are vested in the British South African Company. Several countries in Asia have definite closed door policies. Japan is closed to all but Japanese subjects. In China, free exploration is not permitted, and all ordinary minerals (aside from building materials) theoretically belong to the state, though considerable bodies have been alienated in actual practice. Fee simple ownership is not possible. In order to secure the right to prospect in British India, one must secure a certificate of approval and a prospecting license. In the Federated Malay States, regulations require the tin produced to be smelted in the British Empire. In Europe, mineral land policy varies considerably. As a rule, the closed door policy exists unless other rules seem expedient. Spanish mining is on a decree basis, which means that power to grant mining rights reposes ultimately in the ministry. Foreigners and citizens are subject to the same treatment under the many mining regulations in Belgium. In Rumania, several salines are state monopolies, and the state has established oil reserves.

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[102] The Committee argues that many of the recognized ills of our domestic mineral industries—particularly excess capital investments, variable and uncertain market demands, and irregular tenure and labor, combined with the problems peculiar to the mining industry, which center around exhaustibility and irreplaceability—can best be dealt with by private ownership and operation, with public supervision and control. (National Resources Board, *op. cit.*, p. 423.)

[103] The brief statements concerning different national mineral policies are taken from J. W. Frey, "The Open Door Policy of Mineral Developments," in C. K. Leith (ed.), *Elements of a National Mineral Policy*, pp. 72–78.

This brief statement of mineral policies in some other nations indicates that in most cases private exploration and exploitation of mineral resources have been considerably restricted. In some nations, special restrictions prevent aliens from participating in exploitation; but in most of these nations, similar restrictions and public control hold for nationals as well. The conditions growing out of unrestricted exploration and exploitation which most nations have experienced are such that they have learned their lesson and are taking a more intelligent view of future policy by establishing public controls and restrictions which will tend toward a wiser use of natural resources in the public interest.

OWNERSHIP OF WATER AND WATER RIGHTS

Tenure problems associated with water resources vary with the type of use involved. In the case of irrigation water, tenure problems are largely those of dividing property rights among various private users. In the case of water power, they are largely those involving division of ownership and control between private and public agencies.

Water Rights for Irrigation. The first generation of western settlers gave little thought to their right to use creeks and rivers for irrigation. When settlements were small and widely scattered, the few users on each stream had the entire supply; but as settlement increased, competition increased and the *doctrine of priority* was evolved. According to this doctrine, water rights were established according to the order in which utilization had been made by the settlers. But complications arose in applying this doctrine, and the *doctrine of relation* was adopted.[104] This doctrine holds that the right does not date from the time the water is used, but from the time of beginning construction work,[105] although the proving of the water right is not completed until water has been actually diverted and used. Neither of these doctrines, however, defined the quantity of water that could be used; for this purpose, *beneficial use* was made the measure. That is, each appropriator has a right to continued use of the quantity of water put to beneficial use at the time a later right was acquired.[106]

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[104] Since many ditches were built about the same time, it became necessary to determine what constituted first use. For example, should the water right date from the time of actual water use, or from the time when construction of canals or ditches began? If the right were to date from time of actual use, a premium would be placed upon poor construction, since it might happen that during the construction of a large canal, more easily built or smaller ones might be completed, and appropriate all the water, leaving the larger canal a total loss to its builders.

[105] To prevent abuses, the doctrine of relation has been modified in actual practice by providing that construction must be carried on with due diligence. (See Elwood Mead, *Irrigation Institutions*, Macmillan, 1903, pp. 65–66.)

The Appropriation Doctrine. The appropriation doctrine of water rights for irrigation can be summed up as a right limited to the amount of water which can be beneficially and continually used for the purpose for which the right is acquired. In spite of the fact that the appropriation doctrine has important weaknesses,[107] it does enable arid and semi-arid regions to develop more nearly to their maximum producing ability through utilization of their coordinated resources. Since an individual does not have to live on the stream to utilize its waters, he may operate land at a considerable distance and transport the water through canals or ditches to the spot where it can be most beneficially used. He is not required to return the water, or any part of it, to the stream in any manner, so that great flexibility is possible in determining the lands upon which the water will be used.

Under the appropriation doctrine, the right to water use is a separate property right distinct from property in land, and can be sold separately from the land, so that an individual could purchase a water right to apply to already-owned acreage which could not be utilized effectively because of the absence of water. The public interest is served by utilizing waters on non-riparian lands, so that economic and social conditions are better than when homes and irrigated lands are confined to stream banks. However, the appropriation doctrine does not necessarily bring about the best use of water. If earliest appropriators are, for the most part, at the lower end of the stream, there may be much less efficient total use of water than where most of it is appropriated upstream near its source, and use is made progressively downstream for other operators. This is due to the fact that, in mature irrigation projects, as much as 30 per cent of the water, on the average, returns to the streams as seepage and can be utilized on lands lying downstream.[108]

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[106] What constitutes beneficial use, and the determination of the quantity so used, is left to the courts in most of the states. Decisions on these points have been hotly contested, and many controversies have arisen which show the practical difficulties of applying the theory, as well as the keen competition for use of limited water supplies in arid and semi-arid regions. (*Ibid.*, pp. 66–67.)

[107] In most states, posting and recording notice of water use is required in acquiring an appropriation right, but there is no limitation upon the amount of water that might be claimed. As a result, the sum of all notices claiming water in a given stream is in many cases much greater than the total flow of the stream, and often several times as large. (See T. S. Harding, *Water Rights for Irrigation*, Stanford University Press, 1936, pp. 35–36.) Notices are useful in determining priorities, but they are of limited assistance in determining the size of the rights. Courts are often called upon to *adjudicate* the rights of a stream—that is, to hear all the testimony, get all the records and information available, and allocate the water in the given stream to various claimants on the most just and equitable basis.

The Doctrine of Riparian Rights. The doctrine of riparian rights grew out of the common law of England and was transplanted to the eastern United States. According to this doctrine, the owner of land along a stream has the right to use the waters thereof, provided he returns the water to the stream undiminished in quantity and unimpaired in quality. Obviously, irrigation consumes most of the diverted water, and in many cases that which is returned is muddy and, in a strict sense, "polluted." However, irrigation with reasonable regulation has been recognized as permissible among riparian owners in early English and eastern cases where such use was involved in riparian right litigation.

Modified riparian rights are recognized in the semi-arid states of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Washington and Oregon have placed various limitations on the application of the riparian doctrine. In California, riparian rights have been recognized to a greater extent than in these states, while the remaining eight western states recognize only the appropriation doctrine.[109] It is significant that in the eight western states which recognize riparian rights, the climate is partly humid and partly arid. The riparian doctrine has a climatic fitness in the humid parts of these states, and where riparian rights have been recognized, they will probably not be abandoned. In most of these states, however, the courts have so changed the character of the common law doctrine of riparian rights that it can hardly be recognized. In California, recent decisions have practically extended riparian privileges to all the lands within the drainage basin of a stream, instead of restricting them to the owners who live along its banks.[110] The riparian doctrine has been modified in other states to make it possible for the waters of western streams to be utilized for irrigation, while strict adherence to the riparian doctrine as such would make this practically impossible.

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[108] See *ibid.*, p. 27.

[109] See *ibid.*, p. 55.

[110] See Mead, *op. cit.*, p. 323.

Loss of Water Rights. Water rights are real property and their loss can be decreed only by proper legal procedure in courts having jurisdiction over such property titles. *Abandonment* of an appropriation right is the voluntary releasing of use and right to use, while *forfeiture* is the loss of water rights due to non-use for a period long enough to represent intention to abandon. The period of non-use which constitutes forfeiture varies, and is generally defined by statute. Failure to assert one's water rights may under certain conditions result in their loss. For example, the failure of lower users to assert their rights against an upper appropriator may result in his acquiring rights adverse to those of the lower owners. Rights acquired under such conditions are called "rights by adverse use or prescription."[111]

Public Control of Water Power. Water power is subject to public control either through direct government ownership or through regulation by various state and federal bodies. Most notable of such federal agencies is the Federal Power Commission. The numerous requests for permission to construct power dams, and the work involved in determining whether or not the interests of the United States would be affected adversely by the proposed construction, led to the creation of the Federal Power Commission in 1920, to relieve Congress of this burden and to establish a more general determination of policy in such matters. Federal authority granted by the Constitution over navigable waters has been extended over non-navigable streams which affect the capacity of navigable streams. Perhaps more control is exercised over certain phases of power use and development than is required strictly for navigation purposes; in any case, the courts have upheld the 1920 act on the ground that its principal purpose is the protection of navigation.[112]

Each of the larger states has also established a bureau or commission charged with duties relating to state control of water power. Most states have created regulatory commissions with jurisdiction over electrical utilities. These commissions have established for the utilities accounting systems to be maintained, upon which rates for power sold to consumers may be based. Regulation of rates for services and securities involved in producing and distributing power generally falls wholly within state lines, and is consequently within state jurisdiction; but where electrical energy is transmitted over state lines, such transmission becomes interstate commerce and in most cases is a matter for federal jurisdiction.

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[111] In order to establish a right by adverse use, the diversion must be (1) continuous for the statute period, (2) open, (3) notorious, (4) peaceable, (5) under claim and color of right, and (6) to the damage of the one against whom the right is acquired. (See Harding, *op. cit.*, p. 86.)

[112] See National Resources Board, *op. cit.*, p. 378.

Increasing use of electricity makes an active policy of public development of water power highly desirable. There are many reasons why the federal government should be given primary authority over and responsibility for such a policy. The Energy Resources Committee of the National Resources Planning Board points out that private business firms cannot be expected to undertake the several important non-power functions which cannot yield salable products. It states, moreover, that private business firms cannot even be expected to bring about the most economic development of water power, because the necessary storage does not seem to be generally justifiable for power alone. State and municipal projects may fit in well with federal plans, but the interstate character of most major streams and the international character of some of them make state jurisdiction too limited for the drainage-basin plan. The Energy Resources Committee also recommends that the federal government eventually purchase and absorb private water-power plants, if separate private operation conflicts with the drainage-basin plan, on the grounds that preservation of such private interest in a stream would ordinarily prevent thoroughgoing design and best coordination of water controls.

Government Control over Water Resources. The nature of government control over the utilization and conservation of water resources will be affected greatly by the status of intrastate and interstate water rights, and by the statutory and constitutional provisions relating to them. The states in general claim and exercise control over the appropriation and use of waters within their respective boundaries, while the federal government has been exercising a steadily increasing control over the waters of the nation through Congressional action based upon its constitutional power to control navigable waters. This increasing federal control over vital water resources has created intense feeling on the part of the states (particularly in the West), who have bitterly resisted it.

Federal Control. The basis of control over utilization and conservation of water resources by the federal government rests principally upon the power of Congress over navigable waters. However, Congress has also exercised jurisdiction and control in connection with flood control, the public lands, interstate compacts, and treaty obligations.[113] Flood control projects of the federal government have involved the protection and promotion of navigation, which affords unquestionable constitutional authority for this type of work. Furthermore, the federal government undoubtedly has the power to build flood control projects to protect interstate commerce over highways and railroads, the postal service, etc. It has also been able, through its authority on rights-of-way over public lands, to exercise considerable control over the use of water in the public land states, especially where its interests are involved, due to irrigation or similar projects. Public lands are the basis of federal support of funds for irrigation development under the Reclamation Act (under which the U. S. Bureau of Reclamation operates), and the federal government has in this manner exercised a degree of control over the development of streams on which federal irrigation projects have been located.

Ownership of unappropriated waters in the public land states of the West is a question which, though long debated, is yet undecided by the Supreme Court. If the United States government owns these unappropriated waters, then it has a property right in them, and they should not be disposed of except by the federal government itself, and then only in accordance with some well-worked-out plan or policy. Interstate compacts, of course, require the approval of Congress, which may interject conditions it deems necessary or desirable.

State Control. The states of the arid region contend that control of the waters within their boundaries lies exclusively with them, and many such states have by constitutional provision or legislative enactment declared that their waters are their property, or the property of the public. These rights in the state are subject not only to the principle of equitable apportionment among the states on an interstate stream, but also to the power of Congress over interstate commerce and navigation. However, the question of ownership of the water of non-navigable western streams has not been definitely settled by the Supreme Court.

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[113] *Ibid.*, p. 378.

The controversy between the federal government and the states over the right to control utilization and conservation of water resources is largely limited to the western arid region. In the states east of the Mississippi River, there has never been any question as to the power of the state to control the waters within its boundaries, because little public land and no federal interests are involved, except in connection with navigation, diversions from one drainage basin to another, or control of runoff waters to prevent widespread floods. The eastern states were sovereign entities when they came into the Union, and reserved to themselves all rights and privileges except those specifically granted to the federal government. In the eastern states, the major purpose of water-conservation activities is to *prevent* damage; and these states, where runoff waters constitute a liability, are anxious to get rid of this menace. In the western states, however, the major purpose of water conservation is to store and hold the waters for irrigation in order to *develop* the semi-arid lands for more beneficial, stable, and profitable uses—and flood waters are a very valuable natural resource. In the states east of the Mississippi, state control of water resources varies from practically none in some southern states to complete control over all water uses and developments in the case of New York.[114]

One of the most important arguments for increasing federal control over water resources is the interstate controversies which arise in the increasing competition for water of certain streams, and the lack of any well-coordinated plan or program of multiple-purpose development. Without any central or regional agency authorized and equipped to consider the development and effectuation of a unified multiple-purpose program for major rivers or streams, competition among the states is inevitable. Interstate compacts are one means by which interstate water problems might be settled; but as yet they are a relatively new and unproved method. All such compacts must be authorized and approved by Congress, and in each case of a compact involving western states, Congress has provided that a representative of the United States be appointed to participate in the negotiations. If for no other reason, federal interest and Congressional power could be upheld under the "commerce clause" of the Constitution, on the grounds that all waters of the country affect the navigation of some stream, and this would give the federal government a constitutional right or interest in every stream. Congress undoubtedly has the power to authorize a federal agency or agencies to make plans for the complete, coordinated utilization of the water resources of each important river system of the country, and to make an equitable apportionment of the use of said waters. However, to enforce the plans and findings of such an agency might be difficult, without clear constitutional authority, or a Supreme Court decree.[115] Eventually, such federal control over water resources may be established; the trend of events seems to be definitely in this direction.

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[114] *Ibid.*, p. 379.

Government Control in Selected European Countries. Singstad,[116] who observed methods of administration and control over water resources in Austria, Czechoslovakia, England, France, Germany, Italy, and Switzerland, states (1) In all seven countries there is more or less complete governmental control of all water resources; (2) three out of seven countries have a department of public works controlling conservation and utilization of water resources; (3) hydroelectric power plants, are, except in Italy and England, largely in public ownership; (4) all countries have a highly developed forestry; (5) land drainage and irrigation are ordinarily done by local districts under government concessions; and (6) all governments exercise rigid control over stream pollution.

OWNERSHIP AND CONTROL OF TRANSPORTATION LAND

Highways, waterways, and airways are publicly owned in the United States, while railroads and pipelines are privately owned. Federal, state, and local governments own and administer the highways, and the federal government regulates the use of navigable streams and waterways. Highway tenure problems largely concern control of the use of roadsides in the interests of recreational development and traffic safety. This problem has already been discussed in the section on recreational land tenure. Public ownership or extensive public regulation and control of practically all land used for general transportation in the United States is now considered to be in the interests of public safety and the general welfare.

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[115] *Ibid.*, p. 381.

[116] See Ole Singstad, "Government Control Over Water Resources in Certain European Nations," National Resources Board, *op. cit.*, 1934, pp. 374–387.

The peculiar characteristics of pipelines have aroused much discussion, and many contend that pipelines are not, in a strict sense, common carriers;[117] nevertheless, they are now subject to regulation by the Interstate Commerce Commission and various state commissions, and all rates and charges are subject to regulation prohibiting injurious and unreasonable charges and practices.[118] It is the duty of pipelines as common carriers to receive and transport oil and petroleum products for all shippers alike regardless of the identity or affiliations of the shippers, and unjust discrimination among shippers, receivers, or localities is prohibited.[119] The law has never been carried out fully. Pipeline rates have not been regulated effectively and independent oil companies complain considerably about the difficulty of getting oil transported in them.

The Mann-Elkins Act of 1910 made telegraph, telephones (wire or wireless), and cables subject to regulation by the Interstate Commerce Commission; also express companies, sleeping-car companies, bridges, and ferries. Since the Federal Communications Act of 1934, communication facilities are regulated by the Federal Communications Commission.

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[117] The purpose for which pipelines in the United States have been built is a single purpose, in a single industry—to transport only one commodity, in one direction. The typical pipeline is built from a refinery or terminal to an oil field to secure a supply of crude oil for that refinery. Functionally, a crude oil pipeline bears more resemblance to the aerial tramway and belt conveyor used in mining than to the common carrier railroad except, perhaps, where a railroad is used for the lumber industry in a logging district. (See Hearings before the Temporary National Economic Committee, 76th Congress, Second Session, Part 15, "Petroleum Industry," Section 2, October 2–7, 1939, Government Printing Office, 1940, p. 8594.)

[118] The Hepburn Act of 1906 changed the Interstate Commerce Act of 1897 to make it applicable to pipelines. The status of pipelines as common carriers has been affirmed by the Supreme Court of the United States. (See the pipeline cases, 234 U. S. 548; and Temporary National Economic Committee Hearings, pp. 8543, 8595.)

[119] All but about 10 per cent of pipeline mileage is owned and operated by companies which are affiliated with other companies engaged in producing or refining petroleum, or both. This small percentage of unaffiliated lines is represented largely by eight pipeline companies which were at one time subsidiaries of the Standard Oil Company of New Jersey, but which were separated by the dissolution decree in the Standard Oil Case. (See Temporary National Economic Committee Hearings, p. 8589.)

URBAN LAND TENURE AND TENANCY

The concentration of large numbers of people in small areas, characteristic of modern urban development, makes the problem of housing and conditions affecting home ownership and leasing of major importance.

Home Ownership and Tenancy. About two-fifths of the houses in American cities are occupied by the owners, while the other three-fifths are occupied by tenants. This percentage of tenancy is higher than that in the case of agricultural land, and the proportion of urban tenants is increasing.[120] (See Figure 40.)

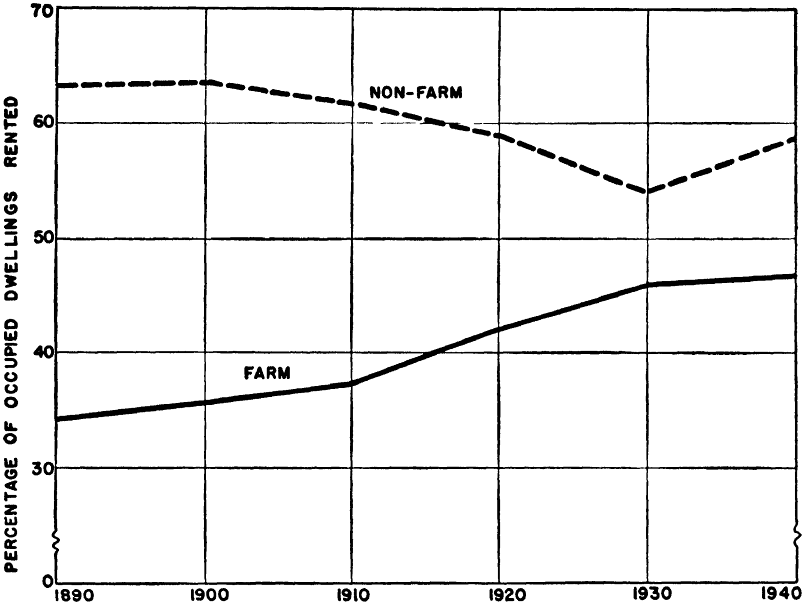

Figure 40. Tenure of Homes, Farm and Non-Farm, in the United States, 1890–1940. (Source: U. S. Department of Commerce, *16th Census of the United States,* 1940, "Housing," vol. II, General Characteristics, Part I, U. S. Summary.)

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[120] It seems probable that 1930 was the peak of urban home ownership in the United States. At that time, 46.0 per cent of non-farm homes were reported by the census as owner-occupied. The 1940 Census revealed that 41.1 per cent of non-farm homes were owner-occupied. (See the 16th *Census of the United States* [1940], "Housing," vol. II, General Characteristics, p. 3.) The tremendous shifts in population to defense and war industries accom-

The problem of adequate housing for low-income urban families is a very serious one. High rentals in large cities create particularly severe hardships for low-income families because of the large percentage of family income required to meet monthly rental payments. Rents definitely tend to rise as urbanization increases, and the percentage of income spent for rent increases correspondingly. During such depression periods as the thirties, when unemployment increased greatly and thousands of wage incomes declined, the urban housing problem became acute in many sections. Low-income families and the families of unemployed tend to concentrate in low-rental areas too frequently consisting of inadequate housing facilities. In many cases, slum or blighted areas have been created by families on the outer edges of cities, where they have attempted to earn part of their living costs by tilling small pieces of land, and to get out from under the heavy overhead of high rentals by building make-shift shacks in which to live. On the outskirts of almost every city, during the thirties, such blighted areas could be seen. In the bigger cities, slum areas exist in the older sections. Half the dwelling units in some cities are physically substandard.[121]

In addition to a high degree of urban tenancy, particularly in the tenement house and slum sections, problems arise from short term leases and rapid turnover of tenants. In one study, it was found that nearly a fourth of the tenant-occupied units are occupied for less than six months, and an additional 27 per cent for a term from six months to a year and eleven months in length. More than half the tenant-occupied units are occupied for less than two years.[122] This brief period of occupance, which is partly a reflection of job insecurity, tends to discourage landlords from making desirable improvements and to reduce the general level of urban housing facilities. A vicious circle usually develops in which areas of short occupancy cause landlords to offer poor housing facilities, resulting in

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panying World War II created serious housing difficulties and increased urban tenancy. (See *ibid.*, p. 3.)

[121] Nearly half the dwelling units in the city of Butte, Montana, were found to be physically substandard, in a survey in 1938. A dwelling unit is rated as substandard in regard to physical characteristics if any one or more of the following conditions exist: (1) need for major repairs; (2) unfitness for use; (3) lack of private flush toilets; (4) lack of a private bathing unit; (5) absence of running water; (6) absence of installed heating; (7) no electricity or gas for lighting. (See R. R. Renne, "A Preliminary Report of the Butte Economic Survey," City of Butte, Montana, October 1939, p. 79.)

[122] *Ibid.*, p. 86.

even shorter terms of tenant occupance. The general result is the creation of unsatisfactory residential districts, inadequate housing, substandard units, and generally unsatisfactory living conditions.

Title Insurance and Registry. The cost of title examinations and insurance is an important element in delaying free transfer of real property. This is particularly true of home ownership—in the case of purchases, as well as loans on houses already owned. Under the present United States recording system, a title search must be made every time a specific tract of land is transferred. Abstracts are prepared which contain all the important matters affecting title; and with each new transfer or mortgage, the abstracting company brings the abstract up to date. In recent years, a system of title insurance has made considerable headway in some parts of the United States, particularly in urban areas. Title companies with records, abstracts, indices, maps, etc., guarantee the holder of a title against loss due to title defects, with certain specified exceptions. The lack of certainty in title under the title search and abstracting systems has made title insurance a practical necessity where the Torrens system of title registry has not been adopted.[123]

The basic principle of the *Torrens system,* originated by Sir Robert Torrens in South Australia (where it was enacted into law in 1858), is registration of title to the land rather than registration of mere evidence of such title. Major characteristics of the system are (1) creation of truly indefeasible titles warranted and guaranteed by the state; (2) provision for special proceedings by which validity of title is established and a governmental certificate attesting that fact is issued, and transfer of title to registered land by entry, to the exclusion of all other methods; and (3) creation of an indemnity fund to compensate those who may suffer damages through the operation of this system. The Torrens system has been adopted in a number of foreign countries and is at present a permissive method in seventeen states, Hawaii, and the Philippine Islands, though it is not mandatory in any state.[124]

In the case of mortgage foreclosures, serious problems are raised by the necessity of extinguishing the mortgage and producing a perfect title. Foreclosure proceedings in the various states of the

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[123] National Resources Committee, *Urban Planning and Land Policies,* p. 243.

[124] For a more detailed statement in regard to the Torrens system and the use of this method of land title insurance, see *ibid.,* pp. 245–247.

United States exhibit a great diversity—particularly in connection with the enforcement of remedies available to the mortgagee after the mortgagor's default. Usually, foreclosure procedure is by action in court.[125] It is generally considered that a simpler method of foreclosure than the ones generally used would be very desirable. The costly and cumbersome features of present foreclosure procedure, and the uncertainties in title so characteristic of present foreclosure methods, should be removed. The Uniform Real Estate Mortgage Act, drafted in 1927, would make the mortgage a lien upon instead of an estate in the premises, leaving the right of possession in the mortgagor until foreclosure is complete. It also provides a simple, inexpensive, and efficient method of foreclosure without resorting to the courts, with ample protection to later lien holders, leaving the title clear, specific, and unclouded. The method is "foreclosure by sale," and a substantial period of redemption after foreclosure sale is provided for.[126] There are merits in making foreclosures more, rather than less, difficult in order to protect occupancy. Refinancing of overcapitalized property and deferred payment plans are important means for reducing disturbance of occupancy.

The "Ground Rent" System, or Long Leasehold Tenure. Long-term leases are a form of urban land tenure which was known in Greek and Roman times. Ecclesiastical and other corporations were required by law to keep the fee simple of their lands in their own hands, and consequently adopted the device of leasing the lands for a fixed term of years. The practice has gradually been taken up by private landowners who recognized the system as a means of retaining land as a source of income for their families and heirs.[127] Tenure for a period of ninety-nine years or more is considered to be long leasehold tenure. (Some leases recorded in Detroit, Michigan, in 1834, were for 999 years.) Distinctive features of long-term leases are ordinarily the provision requiring tenants to erect improvements, pay taxes, manage the property, and pay a fixed rent to the landlord. The chain store type of organization has recently tended to increase the number of long-term leases.

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[125] In 28 states, the procedure is by action in court. Unregulated power of sale is in use in 10 states, regulated power of sale in 5, and various other methods in the remaining states. (*Ibid.*, pp. 247–248.)

[126] The National Conference of Commissioners on Uniform State Laws, at its meeting in Buffalo, New York, in 1927, approved the draft of a uniform real-estate mortgage act which, although it has received the approval of the National Association of Real Estate Boards, the American Bar Association, the American Title Association, and various other organizations, leading practitioners, and scholars, has not been adopted by the legislature of any state, although some have incorporated important features of the proposal into their mortgage and foreclosure acts. The act has probably failed of adoption because of an almost equal division of opinion within each state as to the desirability of the foreclosure method known as "foreclosure under regulated power of sale." The Central Housing Committee at Washington, D. C. has completed preparation of a proposed new model act which is supposed to eliminate some of the weaknesses of the Uniform Real Estate Mortgage Act. (See *ibid.*, pp. 248–249.)

Too often the advantages or disadvantages of long-term leases have been judged strictly from the point of view of the parties to the lease. Too little consideration has been given to the effect of such leases upon the community. Numerous advantages are obtained by the landlord, as well as the tenant; but long-term leases are not always for the good of the public. Tenants often refuse to make improvements, because buildings on leaseholds revert to the landlord toward the end of the lease term. Thus, buildings and neighborhoods are often neglected. The value of the land in or near important business districts may be so great that it would strain the city's financial resources to cope with this problem through condemnation proceedings. Moreover, owners or trustees of estates may refuse to sell their reversionary interest in the property, thus retarding important business or neighborhood developments.[128]

Long-term business leases have undoubtedly helped to advance large real-estate projects; but if such leases are permitted, they should be drawn with some regard to public improvement as well as private tenure; and if the public interest requires certain leaseholds, the law should provide for proportionate compensation according to some specific plan. Without such provisions, leases of more than ninety-nine years, irredeemable leases, and those providing for renewals in perpetuity are detrimental to the public interest, and should be forbidden by statute where no such legislation exists.

The Neighborhood Unit—Pooling, and Replotting Land. Numerous problems, including blighted areas and slums, over-use and under-use of land, high cost of municipal services, tax delinquency, mortgage foreclosures, inadequate housing, and increased tenancy are associated with unplanned and rapid city growth.

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[127] *Ibid.*, p. 255.

[128] *Ibid.*, p. 257.

Greater powers of control than those currently in use are desirable and necessary to insure the maintenance of more satisfactory urban living conditions. As a mean of achieving this control by private initiative rather than by government regulation or ownership, the neighborhood unit plan has been proposed.[129] One form of this plan is the formation of a private corporation in which the owners in a block or area voluntarily pool their interests. They convey title to their properties to the corporation, in return for the corporation's stocks or bonds. Or there may be a voluntary conveyance of all the interest of the owners in an area to a trust company, which issues certificates of interest in a trust to the owners. Another form is incorporation of a neighborhood protective and improvement district, upon the initiative of a large percentage of the owners in a given area. This district becomes a new political subdivision in the city, with the power of eminent domain, and taxation and police powers subject to municipal regulation and control.

"Lex Adickes." An interesting example of pooling and replotting land as a means of correcting defects in urban land utilization resulting from crooked streets, dead-end streets and alleys, poorly shaped lots, and lack of adequate open spaces is the *Lex Adickes,* which refers to a law passed in Frankfort-am-Main, Germany, in 1902, and named after the mayor, Dr. Adickes. This law was the first of several statutes and ordinances which eventually applied the principle of compulsory pooling and replotting of land to almost all German cities. The initiative may be taken by the municipality or by a stated portion of the property owners (ordinarily one-half), provided they own at least half the area scheduled for replotting. A commission appointed by owners and public authorities is authorized to carry out the work. After the land has been pooled, a layout of planned streets, squares, parks, and other public spaces is prepared. After the public spaces have been dedicated, the rest is redistributed as building sites in a proportion as close to the original area and value of the owners' holdings as possible. Holdings too small for building sites are sold to owners of adjacent plots, if possible, and unavoidable differences in value are adjusted by money payments, with the right of appeal to the courts. However, the important point is that, whether initiative comes from the owners or from the municipality, the procedure is compulsory. It can be employed in built-up areas, but no instance of such application has been discovered.[130]

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[129] A neighborhood unit has been defined as an area of a town usually bounded by main traffic roads, without any main traffic routes passing through it. The school is its basic feature, together with all neighborhood recreational and shopping facilities necessary for a self-contained residential unit. It may be considered as a satellite form of government, either within or outside the town itself. (*Ibid.,* pp. 274–275.)

This procedure deserves careful consideration as a means of improving urban land utilization and living conditions. Voluntary reorganization of vacant or sparsely built subdivisions is a most desirable means of effecting needed adjustments, but involves many difficulties. In the case of German cities, the mere threat of compulsion has frequently been sufficient to insure the cooperation of all owners. In the case of urban areas (already solidly built up in most cases) a procedure such as that in *Lex Adickes* appears to be impracticable; and only in the event of catastrophes such as widespread fires or earthquakes, where large scale rebuilding of slums and blighted areas is necessary, would these procedures be particularly applicable.

Public Ownership of Urban Land. In the United States, public ownership has been viewed rather generally as a last resort in controlling urban land use and development, when other methods, including pooling, replotting, and regulatory activities like use of the police power through zoning or through building, sanitation, and other codes have failed or are inadequate. Only in recent years has public ownership been used to any considerable extent in urban land. It has been found in many instances that only by public ownership could governments secure the degree of control necessary for proper land utilization and development. In 1937, Congress passed the Housing Act to assist local public housing agencies to construct low-cost dwellings, apparently on the grounds that it is "probably neither sound business nor good social policy for very low-income urban families to put all their savings into one rather uncertain and unliquid investment."[131]

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[130] In allocating the public spaces, the municipality in Frankfort obtains for public purposes without cost up to 35 per cent of the total area, when it takes the initiative itself, or up to 40 per cent, when the proposal for replotting comes from the owners. *Lex Adickes* has also been supplied in Tangiers (Morocco), under nearly the same provisions as in Germany. A somewhat similar law has recently been introduced in Czechoslovakia, and after the great earthquake and fire that destroyed a large part of Tokyo and Yokohama, a national act was passed embodying the principles of *Lex Adickes,* under which the urban areas were replanned. (For a more detailed statement of the application of this procedure, see *ibid.,* pp. 280–281.)

Land acquisition by city governments may be used to supplement other land use control measures. Also, public purchase of land may exercise an influence on land use beyond the limits of the public tract. The whole character of a neighborhood may be changed by establishing parks or playgrounds, by filling a swamp, or by some similar improvement made through public land purchase. A new highway can materially affect surrounding land values.

National policy in the United States until recently has been so definitely one of getting as much land as possible into private ownership that today few American cities own land beyond their immediate public needs. In contrast, municipalities in European nations often own large holdings, many of them dating from feudal times.[132] In recent years, however, particularly during the depression thirties, submarginal and abandoned areas in cities, prematurely subdivided sections, obsolete factories, and crumbling slums have created situations forcing American cities to take over large tracts of land in order to prevent the spread of decaying areas, as well as to promote rational development of new areas.

The principal arguments for public ownership of urban land are: (1) In many cities, a great deal of land is not profitable in some type of private ownership, and generally reverts to public ownership through tax delinquency. (2) Land is often necessary to carry out a particular program; and when the city government has decided to provide playgrounds, clear slums, or acquire water supply systems, the city government must purchase or secure land in one way or another. (3) Although many argue that private ownership will put land into its highest use, it should not be forgotten that this means the *most profitable* use. A careful distinction should be made between uses which bring financial profit to shrewd or fortunate developers, and uses most beneficial to the taxpayers or the community as a whole. Private ownership, forced through competition to extract the highest possible yield, is ordinarily considered ill-equipped to usher land through a descending scale of intensities and values, and this process will probably be necessary in the future in many cities. In these cases, governments may be forced to take over the adjustment from intensive to extensive urban land use. In other words, public ownership should be considered in conjunction with current needs, rather than on the theoretical basis of the merits or demerits of public ownership compared with private ownership.[133]

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[131] For a more detailed statement concerning the arguments for publicly owned "projects" instead of individual "owned homes," see Catherine Bauer, *A Citizen's Guide to Public Housing*, Vassar College, Poughkeepsie, New York, 1940, pp. 57-63.

[132] For example, in Sweden, Stockholm has acquired since 1924 some 20,000 acres of land, or five times the area of the city. In Finland, tracts were granted for the foundings of towns, with a restriction against alienating full title, so that Finnish towns still own practically all the land within their boundaries. The city of Berlin owns 75,000 acres within its city limits (a third of its area) and another 75,000 acres outside. As a group, German cities of more than 50,000 population own almost a fourth of their area, excluding land in streets, railways, and other utilities. (See National Resources Planning Board, *Public Land Acquisition in a National Land Use Program, Part II, Urban Lands*, Report of the Land Committee, Government Printing Office, 1941, p. 11.)

Purchase of land by the city should be undertaken cautiously, since a heavy buying program might tend to raise land prices appreciably. This would make further purchases more expensive, and perhaps make impossible some of the major benefits that large municipal land reserves might be used to accomplish. Low land prices tend to keep down rents and the cost of home ownership, so that low-income families can have a higher level of housing facilities. Municipal buying of land should be done in accordance with a definite plan for improvement of the city; and, once purchased, development and management of public lands should be given careful consideration by the city officials. Undoubtedly, many cities will acquire comparatively large areas of land through tax reversion, but this method should not be the only one relied upon for increased public land ownership. In the first place, lands acquired by tax reversion will not comprise all the lands which should be owned by a municipality, and may contain many tracts which, under a voluntary purchase program, would probably not be bought by the city. In the second place, if certain tax reforms which should be effected are adopted, tax reversion should decline in the future.

Long-term leases are used by some cities as an alternative to purchase. Leasing has the advantage of involving no capital outlay, and the rental payments can be spread evenly over the term of the lease. But the disadvantage of not having permanent control of the land, particularly in view of the fact that the city may place an extensive system of improvements upon the land, should not be overlooked. This disadvantage can be at least partially overcome by inserting in the lease an option for the city to purchase at a reasonable price upon termination of the lease, or providing for the privilege of renewal, or providing that the city must be compensated for the value of improvements placed by it upon the leased land. Long-term leasing—say, leases of fifteen years—may be particularly desirable where speculation has already developed because of the prospective public improvement, so that land values are exorbitantly high. Costs involved in acquiring such lands under these conditions would be high, whether acquisition is by purchase or condemnation.

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[133] *Ibid.*, pp. 12–13.

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CHAPTER FIFTEEN

LAND VALUATION AND CREDIT

THE level of values at which ownership rights in land are exchanged is a major determinant of the practices and profitableness of utilizing land—particularly agricultural, forest, and urban land. It is, therefore, essential to understand the factors which determine land values, and the relation between sound appraisal practices and successful credit experiences, tenancy, conservation, wise use of land resources, and related land utilization conditions.

The purposes for which land valuation is undertaken are numerous, particularly in modern complex societies. For example, when land belonging to public utilities is assessed for rate making, its value to the utility is sought, rather than its market value. Another important purpose of valuing land is determination of tax assessments.

Valuation proceedings or land appraisals are also required when property is leased, when securities are issued or business enterprises consolidated, when estates are divided, when loans are made on real estate. when disputes between property owners or between private owners and the government must be decided. While the purpose of an appraisal may determine its technique as well as its results, the selling price of land may be taken as the usual standard from which deviations for special uses or considerations may be made.

DETERMINATION OF THE VALUE OF LAND

The determination of what land is worth is a very complex problem, as are all value determination problems. Land values are determined by demand and supply forces operating in the land market. The value ordinarily sought is the "cash market value," in dollars, under competitive conditions, with voluntary sellers and buyers. Certain specific methods for determining this value have been established and are in use.

A Theory of Land Values. Land valuation is subject to all the implications of general value theory, but has certain distinctive features because of the peculiar characteristics of land as an economic good. We noted in Chapter V that land differs from freely reproducible goods in that it is more durable, usually has a negative rate of physical depreciation, has relative immobility, and is not homogeneous. From the greater durability of land and its resulting inflexibility in economic relations arises the peculiar emphasis in land valuation upon its future earning capacity. Because it is impossible to standardize different units of land, because sales are relatively infrequent, and because the real-estate market in many areas is disorganized and local, individual judgment plays a greater part in valuing land than in valuing standardized goods in a more perfectly organized market. However, the general procedure for evaluating land is similar to that for evaluating other economic goods. First an attempt is made to appraise accurately the various factors which influence its worth and, second, a general, final judgment or appraisal of net worth or value is made.

Some writers insist upon the uniqueness of land value, on the grounds that land value has no connections with production or reproduction, but is based solely upon social pressure, as it expresses itself in the demand for land.[1] However, aside from minor instances which in the aggregate are not economically significant, land in its virgin or natural state is not very useful to man, and before land as an agent in production becomes economically productive, man must incorporate capital and labor with it. In this process, land has a cost of production and is subject to much the same economic forces of supply and demand as other economic goods. The point upon which the controversy seems to arise is the difference of origin of land and other economic goods. It is true that land consists of natural resources in all of their forms, and that capital is made up of material goods which man has provided by his own effort and sacrifice; but, as an economic good, land is usually a joint product (land and labor) and is in many ways similar to, as well as different from, capital goods.

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[1] "In the case of goods that are reproducible and in which alternative possibilities are present—goods that have a cost of production—both the goods and their values are social products. They are social as instruments and as value-possessing objects. Land value, too, is social value, but land itself is not a social product; it is not a product at all. All value but land value . . . (with minor exceptions, like unique articles such as old paintings) depends upon the fact that supply as well as demand is socially determined. Such values involve more than social demand; they depend in addition upon items like production difficulty and reproduction possibility." (See G. R. Geiger, *The Theory of the Land Question*, Macmillan, pp. 38–39.)

For purposes of valuation, land may be divided into two major classes—land used for consumption purposes, and land used as a production good. Examples of the first class are residential sites or park areas; and the principles of valuing such lands differ considerably from those applicable to land used as a production agent. The two classes merge in agriculture, where farm and home are one. It is essential, however, that in appraising the value of the farm these two classes be kept separate.

The process of determining the value of a piece of land used in production consists of three steps: (1) capitalization of the income yielded or expected from the land in production; (2) addition to or subtraction from "productive value" of the worth of such intangibles as amenities of site, accessibility of social and cultural advantages, and general character of the community; (3) appraisal of the current status of the land market and the local level of values in terms of expected long-time norms. In the process of land valuation, income capitalization procedures will not be emphasized so much in the older nations, where traditional uses and amenities have been established, as they will in newer areas like the United States or Canada, where usages and associations have not been so long or so completely developed and established.

In Chapter VI we noted that the commonly accepted formula for capitalizing the series of expected incomes into land value is $V = \frac{v}{r}$ plus or minus $\frac{i}{r^2}$ where V is the value of land, a the annual income, r the rate of interest, and i the amount of expected annual increase or decrease. Value so determined is referred to as "productive value." We noted that this formula is useful only as a rough guide, because incomes from land ordinarily do not decrease or increase uniformly, and in longer settled nations where population movements and land uses have become relatively stable, the speculative element plays a very small part.[2]

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[2] For example, the value of land in England is expressed in terms of 20 or 25 years' purchase of the annual rent, the number of years depending upon other elements besides productivity which enter into the calculations; and in prewar Germany the value of land was estimated at approximately 28 times the annual rent. In the United States, however, no such close relationship exists between rent and value. (See E. W. Morehouse, "Land Values," in *Encyclopædia of the Social Sciences*, vol. IX, p. 137.)

Methods of Determining Land Value. It seems perfectly logical to many individuals that in the long run the most reasonable basis for determining the worth of land should be its ability to produce an income. In other words, a reasonable value based on productivity is that upon which the land will return, on the average, a fair rate of interest. This statement, however, ignores other factors which enter into human appraisals. In the first place, how can the intangible psychological elements of site amenities, community character, and quality of home which the land provides be measured exactly and used in a precise formula? How can the prestige attaching to land ownership be valued in dollars and cents? Moreover, future incomes, not past incomes, indicate what land values will be; and the future is always uncertain. Many believe that sales values determined in a freely competitive market by voluntary buyers and sellers will reflect as accurately as values determined by any other method the income-producing ability of the lands, capitalized at the going rate of interest. Here again the same criticism applies—that past sales value, even though based on income, must necessarily be based on past performance and have serious limitations with respect to determining accurately the true long-time net worth or value of the lands.

There are two major approaches to land valuation. There are (1) the *comparison method,* apparently dominant in certain European countries, and (2) the *income capitalization method,* used widely in the United States. The comparative approach uses current sales or market values as the basis for determining what land is worth, while the second method determines land values by capitalizing the income produced by the land. Each of these two basic methods has its peculiar limitations and advantages, and a combination of the two appears to be growing in favor as an accepted appraisal practice. The extent to which either will be emphasized in a combination approach depends to a large extent upon local situations and conditions.

The Comparison Method. There is rather widespread general agreement that the income-producing ability of a piece of land used for productive purposes is the major consideration in determining land value. There is, however, widespread disagreement in regard to the best method of converting production estimates into value. The sale-price comparison method establishes the value of land according to the known or recognized value of other comparable land, and consists of two parts—(1) the estimate of productivity, and (2) the use of actual sale prices of lands whose productivity is known as a basis for evaluating the particular parcel. This method eliminates the necessity of estimating future income, costs, and capitalization rates because, in effect, it accepts the market evaluation of all of these. Unfortunately, however, market-determined present values are commonly very poor indicators of future values. During periods of optimism, speculative forces may temporarily so affect the sale value of land that it is not recognized as the reasonable or real economic value of the land. Likewise, during depression periods, future prospects may appear so gloomy that current land values have little relationship to the real long-time earning ability or economic value of the land.

The land market is profoundly dependent on experiences of the preceding few years in its evaluation of future prospects on which, in turn, its land value judgments are based.[3] The comparative method, therefore, relies upon market values and, because the market is often so seriously out of line with long-time earning power or future income-yielding ability, dependence upon this method alone cannot be considered acceptable unless all alternative procedures are equally inadequate. During periods of relative stability in land values, the comparative method is an excellent way to determine such values. However, land values fluctuate widely during depressions, and in these periods, which may recur unless controls not currently in use are effected, the comparative method will be very unsatisfactory.

Lack of adequate sales data also limits the comparative method. The small amount of land which changes hands through voluntary sales in certain areas is insufficient to establish reliable sales value estimates. For example, in areas where owner operation is common and farms are handed down generation after generation, very few sales occur. On the other hand, in those areas where serious economic difficulties have arisen, there may be a large number of land sales, though few are voluntary. Consequently, before sales value data can be considered adequate to determine reliable values, there must be (1) an adequate turnover of lands through voluntary sales, (2) an effective means of distinguishing between bona fide sales and those that are not (since many land transactions are made purely for legal reasons and are not strictly transactions between a buyer and a seller), and (3) fairly complete data on land transfer records, showing the sales price of the transaction. (Many times land is sold subject to an outstanding mortgage on which an amount is due, and in many cases the exact amount due is not mentioned in the deed.)

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[3] See C. R. Chambers, "The Relationship of Land Income to Land Values," U. S. Department of Agriculture Bulletin 1224, 1923; F. L. Thompson, "Factors Affecting Real Estate Values in the United States," *Journal of Farm Economics*, vol. XVII, no. 2, May 1935, pp. 379 ff.; L. H. Bean, "Inflation and the Price of Land," *Journal of Farm Economics*, vol. XX, no. 1, pp. 310 ff.; and Conrad H. Hammar, "The Synthesis of Materials for Appraising," in *Proceedings of the Conference of the American Society of Farm Managers and Rural Appraisers and the Appraisal Institute of Canada*, vol. IV, no. 3, November 1940, p. 80. Bean indicates that one-half of a given rise in farm land values over a period of years may be associated with prices of farm products in the current year.

In addition to the scarcity of bona fide sales with complete financial information indicated in the deeds, there is the difficulty of determining what kind of farm or urban property it is that has been sold, and how it compares with the farm or urban property in question. The lack of standardization in the land market resulting from the uniqueness of each parcel of land accounts for this added difficulty. Quotations on wheat indicate a price arrived at for a commodity accurately described and labeled according to definite standards; but in the case of land it is extremely difficult to be certain that a given purchase price represents a going market value. The sale prices may be unduly low because the two parties are related, or unduly high because an extremely small down payment is made.[4] Thus, it is evident that there are various difficulties involved in the use of sale prices to determine land values, but wherever adequate sales data are available, they should be used fully.

The Income Capitalization Method. The income capitalization method consists of: (1) an estimate of productivity and net income; (2) choice of a capitalization rate; and (3) adjustments to capitalized value to account for the intangible features.[5] In determining net income to be capitalized, the gross income or return from the land is estimated from the best data available, and from these gross returns necessary production costs are deducted. In determining costs of production, typical operation and management are assumed, and the net income is capitalized to obtain the value of the land.

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[4] Murray points out that price is assumed as the actual quotation in sales transactions, whereas value includes not only actual prices but also estimates of price and estimates of worth other than those established in the market. "Sales prices, in this unorganized condition of the land market, may be misleading unless unusual care is taken to make sure what was in the minds of the buyers and sellers." (W. G. Murray, *Farm Appraisal,* Iowa State College Press, 1940, p. 184.)

[5] Cf. *ibid.,* p. 177.

Although capitalized income is considered by many as a cardinal principle in the determination of land values, its application has some very serious difficulties. In the first place, the net income to be derived from land cannot ordinarily be estimated accurately from data available. For example, although more farm operators have used farm records in recent years, in connection with agricultural adjustment and federal income tax programs, there is still a serious lack of reliable farm management operating cost and income data upon which to determine net returns to be capitalized into land values. Where rather complete cost of production and income data are available, many estimates and judgments enter into deriving a capitalized value.[6]

Use of the income approach involves arbitrary choice of a level of prices on which to determine estimated income. In most cases, hindsight is considered the best basis for foresight, and long-time historical records, rather than current prices, are used as the basis for estimating future price levels, for purposes of income determination. In areas where much land is leased, the estimated net income of land can be closely approximated from the lease rates. However, use of the typical landlord or rental share method has some limitations, including the fact that about as much estimating is required for determining the landlord's expense items as is necessary in the cost accounting or operating budget method.[7] Another limitation of the income capitalization method is that a high proportion of land value is made up of non-income factors, or what might be called "the amenities," which are psychological factors whose income value can be only roughly estimated. A further difficulty arises in marginal areas where average expenses and average returns so closely approximate each other that a very slight change in yield or expense means a significant difference in the capitalized land value.

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[6] See the author's treatment, "Land Classification as an Aid in Real Estate Assessment," *The Classification of Land,* University of Missouri, Agricultural Experiment Station Bulletin 421, December 1940, p. 83. A prominent member of the American Union of Real Estate Appraisers lists eleven estimates involved in the subsidiary estimates necessary for deriving values on an income basis. (*Property Taxes: A Symposium, Tax Policy League,* 1940, p. 215.)

[7] Cf. E. C. Hope, "A Discussion of a Paper by Conrad H. Hammar on the Synthesis of Materials for Appraising," *Proceedings of the American Society of Farm Managers and Rural Appraisers and the Appraisal Institute of Canada,* vol. IV, no. 3, November 1940, pp. 100–101. Hope states that on the average-sized farm, "the landlord's estimated expense items are as large a proportion of his receipts as the estimated total farm expenses are of total receipts."

Many feel that under these conditions, present cost accounting and estimates of net income are too inaccurate to be adequate. There are numerous other difficulties involved in using the income capitalization method, particularly in certain types of farming areas and manufacturing enterprises. For example, in the New England states and the eastern part of the United States generally, there is a great diversity of agricultural enterprises, and tenancy is comparatively small. In these areas, the income method is at a distinct disadvantage compared with its position in more specialized commercial farming areas like the Great Plains, or in the one-crop cotton South. Commercial poultry and dairy farms approximate manufacturing plants and in many cases the soil contributes a relatively small part of the income, the major items being buildings, management, and location. Very small and part-time farm units frequently do not show much or any net savings to be capitalized by strict cost accounting methods, but home and location features and related amenities are involved, and make the inflexible allowances for family living used so generally in farm cost accounting techniques seem ridiculous, particularly where a negative return is involved. Use of the income capitalization method must be modified in such cases if it is to be most useful.

Choice of a Capitalization Rate. Another important problem involved in the income capitalization method is the rate to be used in capitalizing the net income into land value. Choice of a capitalization rate is extremely important, because a shift from 5 per cent to 4½ per cent adds more than 11 per cent to value, so that a tract of land worth 50 dollars an acre would be worth $55.55. Obviously, the higher the risk in the area, the higher should be the interest rate used in the capitalization process, since the interest rate reflects both the productivity of capital and the risk involved in maintaining the principal.[8]

The current method of utilization is an important factor in determining the rate of capitalization, and since the type of utilization may change considerably within a relatively short period of years, serious difficulties are involved in using a constant rate of interest, the usual procedure in the capitalized income technique.

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[8] For example, in the more commercialized and specialized types of farming areas, and in the dryland-wheat-producing areas of the Northern Great Plains, a risk higher than in some other areas is inherent in the existing type of agriculture. The same principle applies on the family-sized diversified farms in more humid areas.

In the case of yields and prices, the use of long-time historical records or averages, or base period averages, enables certain norms to be established for these items. However, no such norms are established or available for use in selection of the capitalization rate. In determining the specific rate to use, certain alternatives are available: (1) the current average rate on real-estate mortgages in the community at the time, (2) the average rate at which money could be borrowed on real-estate mortgage security at the time, (3) the long-time average rate on real-estate mortgages over the last twenty-five or fifty years, (4) other periods or bases. Use of long-time average rates is not a very sound practice if the trend of interest rates is definitely downward or definitely upward. Moreover, the average rate on mortgages in existence would probably not reflect the capitalization rate accurately, because what the community expects the rate to be over the long period during which land purchase and sales contracts normally extend would probably not coincide with the average rate on mortgages in existence.

Moreover, some students question any use of the borrowing rate as the basis for the capitalization rate, on the grounds that the borrowing rate reflects a response to forces which are quite different.[9] Mortgage rates are also becoming more and more institutionalized, because of the great share of mortgage credit held by federal agencies. Loan rates on these mortgages are determined by Congressional statute and by the investor's rating of debentures which are quasi-public in nature. Mortgage rates so determined do not necessarily represent prospective risks and returns from land purchase or sale. The mortgage rate has tended to become virtually uniform over all areas of the United States, as the result of the policy of public lending institutions, such as the Farm Security and Farm Credit administrations. However, as previously noted, the capitalization rate should reflect the great variations in risk among regions of the country. For all these reasons, therefore, it does not seem desirable to use the mortgage rate of interest for purposes of capitalizing land values.

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[9] Hammar points out that, to begin with, mortgage credit is not extended alone or even preponderantly for purchase, but is usually employed for refinancing, to provide buildings and other more or less permanent improvements, to purchase equipment and livestock, and for many other purposes. "The forces which determine the mortgage rate of interest, therefore, are a composite of the lender's evaluations of the risks and returns of many loans for such purposes, and of the borrower's evaluations of the anticipations of the marginal efficiencies of the types of capital in which the money is estimatedly to be invested." (Hammar, *op. cit.*, p. 83.)

During periods when the appraisal of investment risks is high because of a preceding period of falling land values, numerous bankruptcies, foreclosures, unfavorable weather, and poor economic conditions, the capitalization rate would probably approach closely the average land sale and purchase contract rate. However, during periods when farm and urban incomes and land values have been stable for a considerable time, or when they are rising, the capitalization rate will closely approximate the average mortgage rate.[10] In any case, however, the capitalization rate deserves further research and study, and is one of the items in the income capitalization method of determining land values that must be handled with extreme care. The land appraiser must in every case seek the average of various extremes, and support his judgment by comparison with other rates (such as the rates on long term federal, state or provincial, or municipal bonds, or the rates on bonds of local governmental units) typical of the area in which he is appraising land.

The Value of Improvements. Determination of the value of buildings and improvements added to land is another complicating item in the appraisal process. There are times when unimproved land of a given grade is as valuable as improved land, because of the fact that unimproved land will fit into the operating plans of the renter (lessee) as well as or better than land containing buildings or other improvements. Under these conditions, the value of the improvements (based on productivity or rents which can be secured) will be zero. However, such cases are the exception rather than the rule; and—particularly in under-settled and under-built communities—added improvements increase the value of the property appreciably. The American Society of Farm Managers and

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[10] Hammar indicates that the most likely capitalization rate of farm income lies somewhere between the mortgage rate of interest and the land contract rate, and points out that in most areas of the United States the land transfer contract rate is customarily above the mortgage rate by 20 or 25 per cent. (Hammar, *op. cit.*, p. 83.) Hope, on the other hand, points out that in Saskatchewan the opposite is usually true, the typical mortgage rate for some years prior to 1931 being 8 per cent with practically no regional variations, and that during this period land contract interest rates ranged downward from 8 to 6 per cent, with nearly all private, Hudson Bay Company, and railway land sales contracts at 6 per cent. (Hope, *op. cit.*, p. 97.)

Rural Appraisers recommends that buildings and other comparable improvements be appraised on the basis of reproduction cost, less observed depreciation, and acknowledges that obsolescence is frequently a major item of depreciation.

In some of the older parts of the United States, studies have shown that the size and condition of buildings on farms are a fairly good index of farm land values. While this may be true in the older parts of the nation, where many generations have made adjustments by the trial and error method, it certainly would not be a satisfactory way of determining land values in more recently settled areas or in regions where rapid adjustments are occurring in land use. Even in the longer settled areas, size and condition of buildings as a guide to land value should be used very cautiously, and in any case always supplemented with soils, topography, and related land classification data, for the condition of buildings, especially on individual farms where some money has been inherited or there are sources of income other than the farm, can be very misleading.[11]

Advantages of the Income Capitalization Method. In spite of all the difficulties connected with applying the income capitalization technique to land value determination, it has many advantages, and if used as scientifically as possible and supplemented with good judgment, it performs an important function. In the first place, it calls the land appraiser's attention to the factors and forces that influence value. The appraiser must understand the conditions which affect income and living costs, probable future developments in prices and costs, and related matters. Moreover, the income capitalization method centers attention on the developments of the future, while the comparative method tends to emphasize past history of sales values. The emphasis in the income capitalization method upon forecasting necessitates a refinement of statistical techniques and studies to make possible more accurate prediction. Emphasis upon scientific method in forecasting helps to offset the swings of the economic pendulum associated with booms and depressions, which affect the values used in the sales-price method.

[11] In many areas, farms which have been foreclosed by insurance companies or other corporations or agencies have had heir buildings given a fresh coat of paint with corporate funds. Nowell relates the story of the woman who refused to have her buildings repaired and repainted: "If I do," she said, "the neighbors will think I have been foreclosed." (See R. I. Nowell's discussion of A. B. Lewis's paper, "Land Classification as an Appraisal and Credit Aid," in *The Classification of Land,* University of Missouri Agricultural Experiment Station Bulletin 421, p. 77.)

The net result should be more scientific lending and borrowing policies during rising price periods and more courageous, less panic-stricken policies during depression periods.

In addition to these advantages, use of the income capitalization method provides many items and data extremely valuable to borrowers, lenders, buyers, and sellers. Accumulation of such data will eventually afford a much better basis for appraisals; and many of the serious consequences of earlier appraisals—including waves of land speculation, booms, and panics—will be removed or greatly reduced.

The Combination Method. The limitations of the comparative method and the income capitalization method of valuation have led many students to conclude that a combination of both methods would be a more desirable approach. According to the American Society of Farm Managers and Rural Appraisers, "the use of both the income capitalization and comparative approaches to value is necessary in every appraisal, and one should not be emphasized to the minimization or exclusion of the other."[12] It further points out that if the comparative approach is used independently of the income capitalization method, the income valuation would necessarily be included, and that it is therefore expedient to use the comparative approach to adjust the income capitalization value. However, some appraisers reverse this procedure, and use the income capitalization value as a check. In any case, both methods should be combined for most effective appraisal policies.

In areas like the corn belt, where tenancy is common, values are high and non-income factors make up a smaller percentage of value. The income approach may be emphasized and sales value used to provide information on the value of the non-income items and to check the reliability of income estimates. On the other hand, in areas where the opposite is true, sales value may be emphasized and income figures used as a check.[13] The two methods are means to the same end, and since one approach may be better than the other in certain areas, use of both methods, with more weight given to the one better adapted to the specific area, will be the best approach to sound land value appraisals.[14]

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[12] *Journal of the American Society of Farm Managers and Rural Appraisers*, vol. II, no. 2, p. 91.

[13] Murray, *op. cit.*, p. 184.

[14] Cf. *ibid.*, p. 185.

FACTORS INFLUENCING LAND VALUES

These methods of determining land values apply generally to land, regardless of its use. However, numerous physical, economic, legal, and other factors also influence the value of land for certain uses. In every case, the appraisal process requires an examination and weighting of these various factors.

Factors Influencing Farm Land Values. Physical factors important in determining the value of farm lands include character and chemical content of the soil, variety of crops to which the soil is adapted, number of acres under cultivation, size and condition of fields, amount of woodland, topography, length of growing season, percentage of area tillable, rainfall, drainage, and similar factors. Economic factors include the distance to market or town; the type of road, which obviously influences time and costs involved in marketing and transportation to and from school, churches, meetings, etc.; level of taxes and special assessments; type, size, and condition of buildings and other improvements on the land; and character of title to the land (whether it is clear, or subject to liens or omissions which make the title abstract confused). Certain legal factors, such as legislation in regard to uses which can be made of the land, and the right to sell, bequeath, or otherwise transfer title also have an important bearing on value.

Numerous attempts have been made to determine by statistical measurement the relative importance of various factors determining farm land values. For example, in the corn belt, one study found that four factors—(1) ten-year average yield of corn per acre, (2) percentage of land in corn, (3) percentage of land in small grain, and (4) percentage of land not plowable—explained most variations in farm values.[15] Another survey, in Minnesota, found that six factors—(1) value of buildings per acre, (2) type of land, (3) crop yields, (4) distance from market, (5) size of adjacent city or village, and (6) type of road upon which located—were of major importance in explaining land values.[16] In another study in southeastern

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[15] Together, these four factors gave a multiple correlation coefficient of .9166. (See Henry A. Wallace, "Comparative Farm Land Values in Iowa," *Journal of Land and Public Utility Economics*, vol. II, no. 4, October 1926, p. 389.)

[16] In this study, a multiple correlation coefficient of .81 was secured. (G. C. Haase, "Sale Prices as a Basis for Farm Land Appraisal," Minnesota Agricultural Experiment Station Technical Bulletin 9, 1922, p. 3.)

Pennsylvania (which is a longer-settled area), Ezekiel found that a multiple correlation of eight factors accounted for 60 per cent of the land value variations, and that buildings are by far the most important of these factors, with land (including fertility, topography, and proportion usable) next in importance, though much less important, general factors of location and type of road being of very minor significance.[17]

Studies such as those cited account for only a part—though a large part—of the variation in land values, and the land value to be explained is itself only a rough approximation, because census reports on the value of land (which were the land values used in these studies) are merely estimates of sale price made by farmers in response to questioning from the census enumerator.[18] Nevertheless, studies along the lines of those cited do give an approximate numerical weight to the various factors which account for sale prices and sale value estimates and, in this way, indicate the relative importance of the factors which influence farm land value in different sections of the country. Note particularly the differences between factors of major importance in Wallace's study in the corn belt and Ezekiel's study in the eastern dairy section.

Factors Influencing the Value of Forest Lands. Several decades are ordinarily required to mature trees, while agricultural crops usually require only a season or a few seasons to mature. The fact that thirty, a hundred, or two hundred years may be spent in growing the forest crop makes it necessary for the income from the land to cover expenditures accumulated over many years. During the growth period, some income may be derived from supplementary uses like leasing and grazing rights, or game privileges. In the United States, cleared forest lands have ordinarily been made available for resale for other uses, and land values established under such conditions are determined by these uses.

In the following chapter it will be seen that the determination of forest land values is most useful for tax assessment purposes, and that it is extremely important to separate the value of the timber from the value of the land. Moreover, it will be noted that the increasing amount of information available on rate of growth, on costs of cutting and milling the trees into lumber and related products, and on long-time average lumber and wood product prices makes it possible to determine values for forest lands on a capitalized income basis much the same as for agricultural lands. However, in the case of forest lands, the rate of capitalization to use is even more difficult to determine than in the case of farm lands, because of the relatively long growth period involved.

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[17] The eight factors used are: (1) dwelling value, (2) dairy buildings value, (3) other buildings value, (4) crop index, (5) percentage of area tillable, (6) percentage of area level, (7) type of road, and (8) distance to town. M. Ezekiel, "Factors Affecting Farmers' Earnings in Southeastern Pennsylvania," U. S. Department of Agriculture Bulletin 1400, 1936, p. 49.)

[18] Murray, *op. cit.*, pp. 196–197.

Factors Influencing the Value of Mineral Lands. Mineral lands differ significantly from farm and forest lands in that the mineral industry has nothing comparable with a recurring crop. When minerals are extracted from the ground, the future supply is reduced. Consequently, valuation must take into account the factor of depletion or exhaustion, and the problem of balancing future needs and present requirements.

The fact that minerals are usually hidden below the surface so that their exact position, amount, and quality are not definitely known leads to a considerable element of speculation in the appraisal of mineral lands. Furthermore, the increasing importance of mineral lands, particularly in connection with international politics and modern warfare, still further complicates the valuation of such lands. The unpredictability of the future rate of technological advance makes future demand for certain minerals extremely difficult to forecast. In the case of some products, such, for example, as uranium-bearing ores used in making the atomic bomb, there may be heavy demand increases and resulting appreciable increases in value of lands containing these minerals; whereas demand for others, such as nitrates, may decline considerably or be completely absent because of shifts and substitutes, so that lands containing such minerals would be practically worthless.

Factors Influencing Urban Land Values. In appraising urban land, a distinction must be made between business and residential property. In residential sites, the so-called "amenities"—view, spaciousness, height, light, architecture, freedom from noise, shape of site, and related factors are highly important. Proximity to schools, churches, and shopping centers is more significant than nearness to traffic, which may be a liability particularly if there is a heavy flow of traffic. Zoning and deed restrictions in certain urban areas tend to stabilize land values; and cost of utility services and other improvements—like sidewalks, paving, and curbing—are important influences, particularly on newly subdivided lands.[19]

Factors influencing the value of urban business sites are quite different from those influencing the value of residential property. In business sites (particularly retail business sites) location with respect to pedestrian traffic and the buying power of these pedestrians is of utmost importance. Consequently, front footage is significant, and corner locations command a premium. In all cases, size and shape of the lot play an important role. If the amount of land available is the proper size for desired development, value will be higher because costs of assembling separately owned small parcels for large building sites are appreciable.[20] The weighting of the various factors which influence value will vary with the type of business to be operated on the site. For example, in the case of factories, nearness to transportation facilities, accessibility, cost of power, and related items are of major importance.

Factors Influencing Values of Lands for Other Uses. The extensive use of land for recreational purposes, particularly in the United States, is a relatively recent development. Consequently, the factors influencing the value of land for this use are not as well known or understood as those influencing the value of lands used for farming, forest, urban, or other purposes. Chapter IX sets forth the various qualities which make certain tracts of land particularly useful or valuable for recreational purposes; and these factors should be given careful consideration in determining the value of various lands for recreational use.

Location in relation to the main routes of travel and land settlement is the most important single determinant of the value of land for transportation use. Strategically situated lands will be utilized for transportation, and will be able to command a comparatively high price. In many cases, such lands have been procured at the expense of other land uses, through condemnation proceedings. In condemnation proceedings, the appraisal used as the basis for payment to the owner gives first consideration to the personal sacrifice which the owner makes in selling the tract involved. Condemnation appraisal is the judgment of the state, through the courts, as to the compensation which it considers a reasonable reimbursement to the individual for sacrifices involved in giving up his property. The sale price established in condemnation appraisal is ordinarily above the current sale price for comparable property, because the seller would not be willing to part with his property otherwise. Condemnation appraisals or valuations for highway or street purchase ordinarily involve only a small strip of a given farm or urban unit. However, this strip may be so located that its use for transportation would be particularly embarrassing, unsightly, inconvenient, or detrimental to the owner; and compensation must take these sacrifices into consideration, though they are very difficult to evaluate. One method suggested is to value the unit with and without the tract or strip in question, the difference representing the value of the condemned tract. Even here, however, considerable judgment of the individual case and the many factors involved will be necessary if reasonableness and fairness are to be secured.

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[19] Cf. Morehouse, *op. cit.,* p. 138.

[20] *Loc. cit.*

Standardization of Value Estimates. Appraisers have tried and are trying to simplify, standardize, and statistically measure their value estimates with some degree of accuracy, by developing appraising formulas. Correlation studies measuring the influence of various factors on certain types of farm lands have been noted. In the case of urban land, formulas have been established giving weights to depth, frontage, corner influence, shape and size of lot, alley influence, restricted lots, off-grade lots, and similar factors.[21] It is generally recognized, however, that standard rules or formulas cannot completely supplant good judgment. Land is, for the most part, an unstandardized, inflexible commodity whose price is determined in a comparatively disorganized local market; and, under these conditions, land valuation cannot and should not be reduced to rule of thumb formulas, helpful as these may be. "Widespread defaults on mortgages and failures of banks in recent years attest the need not only for better methods of appraising but also for appraisers of high professional standards."[22]

Increments and Decrements in Land Valuation. In most discussions of land value during the past century, emphasis has been placed upon land value increments rather than land value decrements. This is explained by the fact that during the nineteenth and early twentieth century, land values in the United States rose steadily, as a rule. Moreover, classical economic doctrine held that the landowner tended to become richer and richer, with the passage of time, at the expense of other groups in society, because of the limited supply of land available to take care of increasing populations and to meet the growing demand for the products of land. This view was held particularly by Ricardo, Malthus, and their contemporaries. They did not foresee the great scientific and technological advances which were to increase the productivity of land and, consequently, increase the economic supply. Neither did they foresee the decline in the rate of population increase through the declining birth rate associated with urbanization and higher living standards. Today, prospects for future land values are quite different from those of a century ago, and in many areas declines are quite as probable as increases. This development necessitates a careful understanding of the factors which tend to increase land values and those which tend to bring about declines. The very low interest rate in recent years has tended to keep land values up in spite of the above factors tending to force values downward.

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[21] See National Association of Assessing Officers, *Urban Land Appraisal*, 1940, for various formulas, including present worth, depth factor, line of coincidence, merge line, and related formulas and rules which have been set up as guides or standards for appraising urban land.

[22] Morehouse, *op. cit.*, p. 139.

One of the most important factors influencing future land value levels is the population. It was noted in Chapter III that the rate of population increase in the United States and many other important nations is definitely declining, and that population in the United States, unless certain very definite changes in population policy are brought into operation quickly, will reach a stationary state. It is generally considered that this trend in population will tend to reduce land values or at least not make any considerable increments possible. Other forces important in determining future land values include prospects for foreign market outlets, the level of domestic economic activity, changing dietary habits and consumption trends, savings and investments, and related factors.

Land Booms and Speculation. There have been numerous land booms in various sections of the United States during its history, but the best known are the widespread land booms of 1832–1836, 1854–1857, 1914–1920, and the Florida land boom of the twenties. In the East, more than a hundred years ago, there was a great boom in Maine timberlands caused principally by the feeling that accessible timber was fast disappearing, and that prices would continue to rise with the development of the country. At that same time, there was much speculation in western town lots and farm lands, based largely upon the rapid westward expansion of population. This boom collapsed in 1836. The land boom which reached its peak in the years from 1854 to 1857 was brought about largely by the great westward expansion of population, and the relatively good prices for grain on the world market, in which the Crimean War (1854–1856) was an important factor. The next big land boom was during the First World War, when unusually high wheat prices, coupled with the knowledge that there was no more free land in the United States, gave rise to the belief that the supply of good farm land was now definitely limited, and that increased demand would inevitably cause land values to rise in the future. Apparently it was not realized that population was being curtailed and that, while the West had been settled, much of the area in range for livestock production could be plowed up and used more intensively for producing wheat

The Florida land boom, which many people thought was a mushroom growth of the twenties, was nevertheless preceded by a fairly long period of growth and development in that state. The state's climatic and agricultural resources, together with its increasingly accessible location, created the psychological basis which, combined with merchandising propaganda, brought about rapid increases in land values. The rise reached its peak in the late twenties.[23]

Land values increased appreciably during World War II (1941–1945), accompanying higher price levels and increased economic activity, but they did not reach the levels of the First World War period for the nation as a whole. For example, farm real estate values per acre rose from an index of 84 in 1940 (1912–1914 = 100) to 133 by November 1945, or an increase of 49 points; while during World War I they rose from an index of 100 (1912–1914) to 170 in 1920, an increase of 70 points. In some sections of the nation, however, land value increases were very large and exceeded or approximated the levels reached during World War I, particularly in the South Atlantic, East South Central, Mountain, and Pacific Coast states.[24]

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[23] Cf. R. C. Limber, "Conditions Characteristic of Land Booms," *Journal of Farm Economics*, vol. XX, no. 1, February 1938, p. 233.

[24] "Current Developments in the Farm Real Estate Market," U. S. Department of Agriculture, Bureau of Agricultural Economics, December, 1945, mimeographed, p. 3.

Land booms have appeared as the culmination of a favorable trend extending over a considerable period, and they are usually accompanied by a set of optimistic beliefs not too complex or abstruse to have wide appeal.[25] It is not necessarily true that land booms must always be preceded by these conditions, because land values tend to respond promptly to pronounced increases in prices and incomes so that any event which caused a rapid upturn in general economic conditions could and probably would cause a considerable rise in land values. However, the nature of the real-estate market makes it seem logical that the rise in land values must exist for some time before it could reach the proportions of a boom. The real-estate market is naturally comparatively slow, and even in boom periods, for example, a relatively small proportion of any community's farms or lots change hands. Consequently, when a considerable number of pieces of land awaiting sale have accumulated during a period of slowly declining markets, these holdings will not be absorbed for some years. This will necessitate a long-continued upward swing in land values before the development of an extensive boom.[26]

The important problem connected with land booms is the method of controlling or avoiding them. Studies reveal that land booms are generally financed not by such first mortgage agencies as insurance companies and the federal land banks but by second mortgage lenders—principally private individuals, former landowners, and others speculating in land. A study of an Iowa county where the land boom was unusually active during the First World War reveals that from 1900 to the height of the boom, insurance companies loaned conservatively and, as land prices rose year after year, continued to keep their advances down to a percentage averaging about a third of current value. When the boom was at its peak, only 29 per cent of the sale price was being lent. In other words, more than

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[25] See Limber, *op. cit.*, p. 234.

[26] Cf. *ibid.*, pp. 234–5. As evidence of the tendency for land booms to be initiated by some actual event which appears to offer prospective increases in income for a considerable period, Limber cites the building of the Chicago Canal, which was assured by 1833, and the consequent Chicago land boom, which got under way immediately. This boom collapsed in 1836, with the issuance of Jackson's Specie Circular, and the Canal was not finished until twelve years later, in 1848. This instance shows how speculative hopes tend to outrun achievement. (See also Homer Hoyt, *One Hundred Years of Land Values in Chicago*, University of Chicago Press, 1933, pp. 45 ff.)

70 per cent of the sale price had to be financed by junior mortgages and cash. An increase in junior mortgages and in the number of individuals who took a mortgage as part payment in the sale of their farms largely supplied this necessary 70 per cent.[27]

Control of Land Booms. It is evident, therefore, that avoiding or controlling land booms necessitates a change in the attitudes and credit policies of private individuals, former landowners, and those who tend to speculate in land, in order that the financing necessary to create a land boom will not occur. In other words, the financing may be considered "the string on the balloon"—it is not the force which causes the balloon to rise, but it certainly is the factor which determines how high the balloon will rise. If these people are not interested in financing land booms, land values will not rise to high boom levels. First mortgage agencies (particularly insurance companies and federal land banks) are much more cautious and conservative in their lending policies; and, while they tend to maintain a fairly constant relationship between current sale prices and amounts of loans, the difference in dollars required by other financing is much greater in boom periods than during normal periods.[28] Unless more funds from other sources are available to supply the difference (and during most boom periods, purchasers cannot obtain the difference) a great increase in land values cannot occur, because purchases and sales cannot be financed at the high prices characteristic of boom periods.

Many believe that it is especially difficult to control land booms without some such specific device as monetary mechanisms, because the lessons learned from boom periods tend to be forgotten with the death of the generation that experiences the conditions. This assumes that land booms occur with sufficient infrequency so that landowners, private lending agencies, and others who experienced the conditions of a land boom have been replaced by a new generation by the time the next boom ocurs.

[27] W. G. Murray, "Land Booms and Second Mortgages," *Journal of Farm Economics,* vol. XX, no. 1, February 1938, p. 230.

[28] This can be illustrated by the following example: Assume that the current sale price of farm land is $48 an acre, and that the federal land bank is lending approximately half of this, or $24. This leaves $24 to be financed by the owner through other channels—either funds of his own in the form of cash, or other borrowings. However, if land values rise to $250 per acre, and the land bank still continues its 50 per cent loan policy of $125, a balance of $125 per acre is required from other sources to finance the purchase of the land.

It has been suggested that land booms might be controlled or even prevented through changes in the mortgage rate of interest, but it seems obvious that unless wide fluctuations in net incomes can be prevented, either through some system of taxation, stabilizing the business cycle, or some other adjustment, fluctuations in the sale value of lands cannot be prevented, though they might be reduced somewhat through adjustment of the mortgage rate of interest. In the United States, up to the present, no technique of controlling the business cycle seems to have been developed to the point where cyclic fluctuations will not recur. Whether this is caused by use of the wrong method or failure in execution is not important here; the fact remains that it has not been accomplished, and consequently the major cause of fluctuations in land values—that is, fluctuations in land incomes—still exists. In comparison with the great swings in land income associated with the business cycle, wars, inflation, population movements, technological advances, and similar forces, changes of one, two, or three per cent in the mortgage rate of interest seem relatively insignificant. During more normal times, the mortgage rate of interest is more important, and might be significant in tending to stabilize land values. A strong credit education program to convince landowners and lending agencies of the permanent advantages and mutual benefits to be secured from more scientific lending practices would probably be more effective, in the long run.

Trend of Land Values in the United States. The United States has experienced land booms, recessions, and panics, but these periods of high and low price levels have not affected the values of all lands in the same way. This is amply illustrated by trends in farm and urban land values during the First World War. The value of American farm land doubled in the 1900–1910 period, and virtually doubled again by 1920, while urban land was generally depressed during the war period, for the war turned world demand away from housing to production of war materials and foodstuffs.[29] In 1920, all urban land in United States cities of more than 30,000 was valued at scarcely more than 25 billion dollars—less than half the value of farm land—but a great reversal set in during the twenties, and by 1926 the value of all farm land had dropped one-third, while urban land values had doubled.[30] The shrinkage in demand for foodstuffs to peacetime levels and the great decline in foreign outlets caused a sharp drop in farm prices; whereas the domestic demand, centering in the large cities, for manufactured products and various personal services caused a great expansion in urban housing and spectacular increases in urban land values.[31]

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[29] Prices of American farm products more than doubled from 1914 to 1918, while average house rents in the United States rose only 9 per cent. (Hoyt, *op. cit.*, p. 233.)

Farm Lands. Although farm land value data prior to 1900 are incomplete for many areas, available records indicate that there have been cyclical fluctuations about a persistent upward trend, with an increasing rate of increase during the century 1820-1920.[32] Since 1920, however, the trend has been downward, at a rate fairly comparable with the rate of increase prior to that time. The persistent upward trend in farm land values up to 1920 was caused largely by an expanding population, and by a lowering of interest rates. The short-time fluctuations about this persistent upward trend reflect the varying economic conditions, especially the changing rate of migration and developments in transportation.[33]

Bean found that the influence of prices on land values diminishes through the years, and that the duration of the influence depends upon the magnitude of price changes.[34] Consequently, during inflationary periods when price increases are large, land values increase significantly and tend to increase during subsequent years, but at a decreasing rate.[35] Obviously, in order to avoid a land boom, monetary price inflation, or rapid, appreciable price advances must be avoided.

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[30] The value of all farm land dropped from 55 billion dollars to 37 billion, while the value of urban land in American cities of more than 30,000 rose from 25 billion to more than 50 billion. (*Ibid.*, p. 234.)

[31] For a more detailed explanation of the cause and effect relationships operating during the early twenties to depress farm land values and increase urban values, see *ibid.*, pp. 235 ff.

[32] Long-time records of land values are available for Missouri from 1820 to date, and Bean found that between 1820 and 1840 the persistent upward trend represented an annual increase of from 3 to 4 per cent, while from 1900 to 1920, the rate of increase was about 8 or 9 per cent. (Bean, *op. cit.*, p. 311.)

[33] *Loc. cit.*

[34] Bean found that the price factor used was roughly equivalent to the current income factor in Chambers' formula, and the varying price lags on land values of subsequent years is substituted for Chambers' factor of anticipated average annual increases in income over a period of years. (Bean, *op. cit.*, p. 313; and Chambers, *op. cit.*, pp. 379 ff.) Bean treated land values as the dependent factor in a multiple curvilinear correlation problem, and treated prices with different lags as the independent variables. He found that of the total variations in land values associated with prices, about 52 per cent are associated with prices in the current crop year, 25 per cent with prices in the previous crop year, and 8, 6, 5, 3, and one per cent in the respective previous crop years. (Bean, *op. cit.*, pp. 313 ff.)

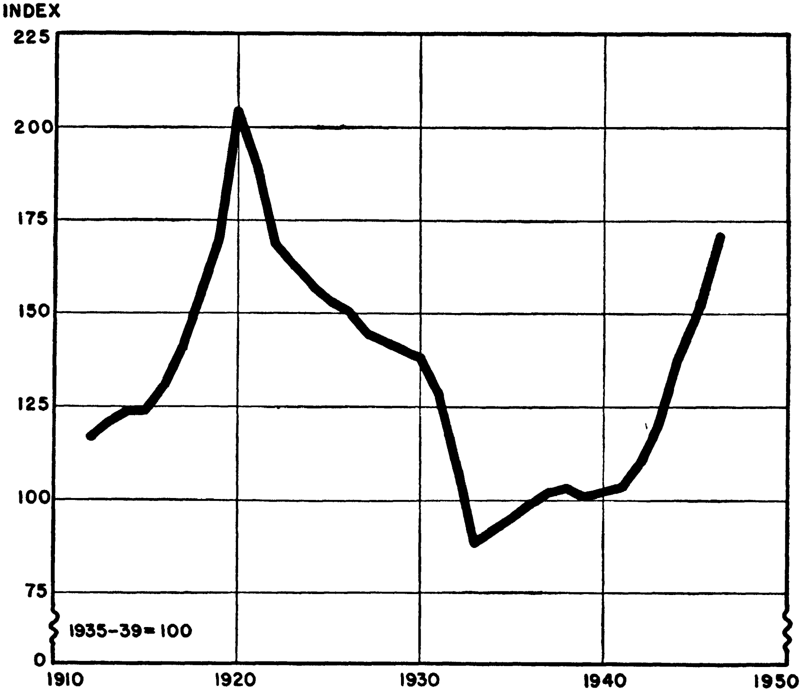

FIGURE 41. Farm Real Estate Values Per Acre in the United States, 1912–1946. Compiled from data secured from U. S. Department of Agriculture, Bureau of Agricultural Economics.

For the country as a whole, average per acre farm land values more than doubled from 1900 to 1910 and nearly doubled again by 1920. Values declined after 1920, and by 1933 were a fourth lower than in 1910. After 1933, values moved upward in many of the major agricultural regions, until at the end of 1945 farm real-estate values were a third higher than in 1910 (see Figure 41).

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[35] Bean found a lift of 130 per cent in the farm price level to be associated with a 47 per cent rise in land values during the current year, the following year with an additional rise of 27 per cent, and during subsequent years with rises which gradually approached zero after the eighth year. In the case of a lift of only 25 per cent, the immediate effect is a rise in land values of about 8 per cent, and in the following year about 3 per cent, with practically no additional influence in the subsequent years. (Bean, *op. cit.*, p. 317.)

Urban Lands. The trend of urban land values in the United States has generally been upward, because of the rapid settlement and development of the country. However, there is such a great variation in the stage of development of different cities that it is impossible to make any accurate statement concerning national trends for any specific period. Moreover, within each individual city there are tremendous variations in land values and trends among different sections and for different types of use.

Land values in the city of Chicago furnish a good example of the difficulty of making any general statements in regard to urban land value trends. Chicago has grown from a small hamlet of a dozen log cabins in 1830 to an urban area with millions of inhabitants, and thousands of dwellings, skyscrapers, stores, factories, warehouses, and related buildings. The ground value of its 211 square miles has risen from a few thousand to 5 billion dollars, but this growth has been very uneven.[36] At times, there has been feverish boom activity with vertical expansion by means of taller buildings, as well as lateral expansion into the prairie. At other periods, growth has been so slow as to be imperceptible, or values have declined. Periods of above-normal activity have been much shorter than periods of depression.

Chicago land values have remained below normal for as long as 26 years at a time, and the shortest period below the trend line was 10 years. Chicago land values and subdivision activity have been above normal only about 29 per cent of the time. American business generally rose above normal approximately thirty times during the century 1830–1933, while Chicago land values advanced above this line only five times, and lots subdivided have been above normal twelve times. Since 1875, American business activity has gone through fifteen periods of prosperity interrupted by periods which were below normal; but during these years there have been only two periods when land values were above normal, four when lots subdivided were above, five when real-estate transfers were above, and six when new construction was above normal.[37] These long periods indicate the absence of a continuously active land market. Absence of adequate data make it impossible to make any sound generalizations concerning the applicability of these real-estate cycles to other cities.[38]

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[36] Hoyt, *op. cit.*, p. 3.

[37] These data have been taken from *ibid.*, p. 418.

LAND APPRAISAL

Appraisal of land is the process of setting a price or value on it. Factors given major importance in this procedure will vary with the specific use or purpose of the appraisal. For instance, appraisals of land for loans emphasize long-range aspects of income-yielding ability, while appraisals for tax assessment purposes stress present condition instead of long-range considerations. The land appraiser called upon to determine land values for special purposes should first determine "basic value" by the adjusted income capitalization value method in which comparative approach and income capitalization method are combined. He can then determine values for special purposes or uses by allowing for special factors or influences.

Purposes of Appraisal. Land is appraised for many purposes. One author lists seventeen purposes, including sale or purchase; reorganizations, receiverships, and mergers; determination of rental value; determination of assets of an estate for inheritance tax purposes or distribution of assets under wills, etc.; determination of values for income tax purposes; determination of rates for public utilities; estimation of cost of an improvement; condemnation purposes; tax assessment; security for real estate loans; and determination of the best utilization of a property.[39]

Appraisal Methods for Specific Purposes. An analysis of two or three of these specific purposes is ample to demonstrate the difference in factors and methods used for various appraisal purposes.

[38] Studies of land values have been made for a few selected cities, including New York and San Francisco (see E. H. Spengler, *Land Values in New York in Relation to Transit Facilities*, Columbia University Press, 1930; and L. A. Maverick, "Cycles in Real Estate Activity," *Journal of Land and Public Utility Economics*, vol. IV, no. 4, November 1928), but there have been no detailed studies of cycles on a comparable basis with Hoyt's study of one hundred years of Chicago land values. For a very general account of land speculation in American cities, see A. M. Sakolski, *The Great American Land Bubble*, Harper, 1932.

[39] F. M. Babcock, *The Appraisal of Real Estate*, Macmillan, 1924, pp. 2–11.

Appraisals for Purchase and Sale. An appraisal of land for use in a contemplated purchase or sale is often the deciding factor in the transaction. It is the duty of the appraiser to render the best possible estimate of the fair cash market value of the property, and to substantiate his estimate with any supporting facts or available evidence. A man contemplating purchase of a farm, for example, is primarily interested in the earning power of the land, based on what he feels will be typical of his management over a period of years. This emphasis on earnings necessitates a careful inventory of land and buildings, soil characteristics and condition, and other land classification data affecting productivity. The more farm management budget operating data available to purchaser as well as seller, the more sound and satisfactory will the value agreed upon be for both parties concerned. Appraisal for a seller should include all the favorable income and non-income features.

In condemnation appraisals, it has been noted, the factor of greatest importance is the personal sacrifice made when the owner parts with the tract involved. Condemnation appraisal involves reimbursing the individual for this sacrifice by what is considered reasonable compensation. It is to be expected that the sale price recommended in condemnation proceedings will be above the current sale for comparable property, because the seller would not sell otherwise.

Appraisals for Tax Assessments. Appraisals of land made by the tax assessor are ordinarily subject to many influences, some of them political, which are not factors in the appraisal of land for purposes such as loans. Shortcomings of tax assessment methods generally in use in the United States are discussed in the following chapter, and only a few observations will be made at this point.

The tax assessor is usually elected by popular vote, and may or may not have any particular qualifications for appraising real estate. Tax revenues from real estate are determined by the assessed value (taxable value) multiplied by the tax levy or millage rate. This tends to cause assessors to appraise lands on levels high enough to secure the necessary revenue. In many states, legislation has limited the tax rate which can be levied on property, and under these conditions an additional influence is brought to bear upon the assessor to place land values at levels high enough to secure the necessary or desired revenue with the maximum levies allowed.

Where there are no legal restrictions on millages, the local assessor may be tempted to lower assessed values, if there is a state property tax levy. Through lowering assessed values, the local area would benefit by paying less than its proportionate share of the state levy.

The fact that tax assessors are ordinarily elected helps to make the assessor unwilling to take much incentive in revising valuations upward, though this might be definitely justified. He follows the line of least resistance, and as a rule would be inclined to lower valuations, if possible, or, if not, leave them unchanged. Three major tendencies are usually evident in valuing land for tax assessment: (1) Valuations tend to become fixed, and undergo little change in later valuations; (2) any actual change is likely to be downward, some properties being reduced considerably more than others; and (3) there is definite evidence that the poor land is overvalued and that there is an excessive concentration of values about the average.[40] The last characteristic is most easily explained by the fact that assessors can measure acres, but not quality. It is impossible for an assessor to distinguish accurately by casual observation among various grades of land, if he has the average amount of training.

Consequences of these tendencies, particularly in connection with increased tax delinquency, growth of tenancy, and poor land use, are discussed more fully in the following chapter.

Appraisals for Loans. Appraisals of farm lands for loan purposes tend to emphasize long-range considerations. The lender who furnishes funds to the borrower in exchange for a mortgage on the farm is primarily concerned with the prospects of loan repayment when the mortgage matures. The major factor which the lender must consider is the quality of security offered, and its ability to produce under typical management a net income from which the loan can be repaid.

Because most real-estate mortgages run for a considerable period of time (ranging from five to thirty or more years), long-range forecasts of the ability of the security to pay out are essential from the standpoint of the lender. The most difficult conditions to forecast are economic conditions and natural catastrophes. The lender is concerned with the risk from price declines and possible increased production costs which together reduce the net income from farm operations necessary to retire the loan. Risks from natural hazards must also be considered carefully, risks of floods, drought, insect pests, and hail being particularly important. In high-risk areas like the Great Plains, it is known that widespread droughts will recur from time to time, but their exact duration and occurrence is impossible to predict. In such areas, only those lenders financially able to bear the special risks involved should take the responsibility of furnishing loans for agricultural operations. The fact that interest rates are apt to be somewhat higher in these areas has in the past frequently tended to encourage lenders with limited funds, seeking relatively high returns on investments, to undertake risks which they are not in a position to carry. When making forecasts in regard to agricultural land productivity, such factors as possible soil depletion through erosion or loss of fertility, or through waterlogging because of poor drainage, or formation of alkaline deposits on irrigated land should be given careful consideration.

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[40] Murray, *Farm Appraisal, op. cit.,* p. 204.

The borrower is not vitally concerned with the appraisal placed upon his land for loan purposes, provided he can secure the amount of credit he deems advisable and necessary for operating his business, and provided the appraisal is well within the limits of his ability to repay the loan. Both the borrower and the lender are vitally concerned in discovering and using the appraised value which represents the farm's productive value. If the borrower is lent more than he can repay, he may lose his holding or suffer serious embarrassment. At the same time, the lender's funds may be wholly or partly lost, or he may have to go through a tedious and often embarrassing experience to collect what is due him.

Unfortunately, there has been no general understanding and appreciation of this mutual interest of lender and borrower in the case of many loans on farm and city real estate. The results have been numerous farm and city bankruptcies and foreclosures. A great many recent loan experience studies point out the mistakes made in loan practices, many of these stemming from overvaluation (especially overvaluation of the poorer grades of land in certain areas) and from failure to apply the best credit terms, arrangements, or practices. Only the future will reveal whether the lessons learned during the thirties have been learned well enough and widely enough so that repetition of these errors will not occur.

MORTGAGE CREDIT AND LAND USE

The influence of credit policies on the level of land values has been noted. Credit policies are also very important in determining the success of land use operations. Mortgage credit is important to users of land, primarily because it provides a source of capital with which they can acquire a farm, business, or home before they have accumulated savings enough to finance the purchase themselves.[41] Adequate mortgage credit, consequently, is an important determinant of the amount of tenancy. Since a relatively large amount of fixed capital is required to finance farm, forest, and many business enterprises, servicing charges (interest and principal payments) comprise a large part of the owner's overhead expense. If satisfactory loan experience is to be achieved and mortgage credit is to fulfill its proper function in the economy by facilitating successful and efficient farm and business operation, the item of overhead debt service charges should be within the earning capacity of the land and its improvements.

Influence of Credit Practices on Successful Land Utilization. Credit arrangements between borrower and lender have a significant bearing upon successful farm or business operation, and on satisfactory mortgage experience records in any area. Four factors in the credit arrangements are particularly important: (1) amount lent in proportion to the true or productive value of the property, (2) length or term of the loan, (3) method of repayment, and (4) interest rate charged.[42] Many loan experiences have been disastrous because the amount lent was too large in proportion to the long-time productivity value, or the true worth of the land. Such loans were most frequently made during boom periods with high prices. Studies in some areas of the United States reveal that in the case of agricultural land there is a mortgage debt per acre greater than the long-time productivity value of the land itself, the debt frequently being double the productivity value, or more. In the case of industrial and urban business sites, similar conditions frequently exist.

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[41] It is interesting to note that the literal interpretation of the term "mortgage" is "a death pledge." Originally, if lands were mortgaged, the title and possession of the mortgaged land passed immediately to the mortgagee or lender upon execution of the loan, and he was entitled to all benefits which accrued to it. Ownership of the property could not be recovered by the borrower if he failed to comply with the provisions of the mortgage contract. This concept has been considerably modified in use, and mortgages do not now necessarily imply such serious consequences; but the importance of correct use of mortgage credit cannot be overemphasized, particularly in the case of farming or urban homes where misuse and abuse of credit have often led to foreclosure and the consequent loss of the farm, home, or business.

[42] See the author's treatment in "Montana Farm Bankruptcies," Montana Agricultural Experiment Station Bulletin 360, June 1938, pp. 7 ff.

If real estate loans are made for too short a term, the annual cost of paying off the loan places an excessive burden on the operator, or the uncertainty of renewing or refinancing the loan upon satisfactory terms at maturity is a source of instability and tends to encourage short-sighted land use policies. In Montana, from a third to a half of the farm mortgages outstanding in many counties are for terms of five years or less. In contrast, when many business corporations borrow, they issue bonds that mature as many as seventy-five or a hundred years later and are often refunded at maturity by the issuance of new bonds.

The method of repayment is also very important. If it is a straight-term loan, the operator must pay interest on the entire amount for the full length of the loan, and he is expected to save up a lump sum with which to pay the loan in full at the end of the period. With the lack of control which individual farmers and many small business men have over production and prices, and the existence of keen competition, this is a very difficult arrangement, even for the more successful and thrifty operators. In contrast, if the loan is *amortized* (that is, if an increasing proportion of the equal annual payment goes for principal and a decreasing proportion for interest, so that when the last equal annual installment is paid the loan is paid off in full) it is usually easier for the operator to pay off the principal, and his total interest charge is significantly reduced. In spite of this, studies reveal, for example, that from a third to a half of the farm mortgages in effect in many areas are straight-term loans.

The rate of interest is an important item in the total cost of the loan. Money lent at 8 per cent compounded annually will double itself in nine years, and the operator who borrows money on a straight-term basis at 8 per cent for approximately twelve years pays the full amount of the loan in interest, and still owes the full amount of the principal. The fact that the interest rate is fixed or rigid means that a much larger proportion of the farm or business income will be taken to pay interest in low-price or depression periods, when times are hardest, than in prosperous or high-price periods.

Credit Arrangements in Marginal Areas. Credit arrangements between borrowers and lenders are extremely significant in marginal areas where natural forces may determine successful operation. For example, in certain parts of the Great Plains where average yearly precipitation is about 15 inches—which is near the critical point for successful crop production without irrigation—there is no natural buffer or cushion of crop dependability, as there is in the more humid areas, to absorb economic stresses and strains resulting from annual variations in precipitation and growing conditions. Without such a natural reserve or margin of crop dependability, a workable substitute or replacement must be established. The need for such a substitute is further increased by the predominating types of farming. Climatic conditions and present methods of land utilization limit agriculture largely to wheat or range livestock production—both highly commercialized one-enterprise types of farming. With such a high degree of commercialization and specialization, farmers and ranchers in semi-arid regions are peculiarly affected by the highly fluctuating farm prices characteristic of modern economies. With these extreme fluctuations in yield and price, the amount available to meet overhead costs (including principal and interest payments) varies greatly. Adjustments might be made in semi-arid sections to bring about greater flexibility or elasticity in the farmer's overhead to absorb his periodic income variations accompanying weather and price variations, and bring overhead more nearly into line with average or normal weather and price conditions. Debt service charges are one of the most important farm and ranch overhead items; consequently, farm credit practices should be those which will result in bringing the amount lent into line with the long-time productivity value of the farm; and annual loan repayments (including interest payments) should be flexible and adjusted to current production in terms of buying power rather than dollars.[43]

Peculiar Credit Requirements of Agriculture. Financing agriculture is a type of operation distinctly different from industrial and commercial financing. The fact that farming is predominantly a small scale one family enterprise with comparatively slow capital turnover, relatively low return on capital, and comparatively little control over production and prices helps to determine the methods of financing best adapted to serve agriculture's credit interests. The fact that American agriculture is made up of millions of small individual enterprises makes the credit sources open to large industrial and commercial concerns not readily available to farmers. A farmer is an individual, and his farm must change ownership and his estate be settled upon his death. This makes debt for the purchase of farms a constantly recurring condition. It has also precluded the extensive application of corporate financing in the form of the long-term bonds used so widely in industrial and business financing; and at the same time, because of the relatively slow turnover of capital in agriculture, farm loans have not been suitable short-term risks for commercial banks where liquidity is of vital importance. This has given rise to the federal land bank system, which provides farmers fairly long-term mortgage credit (for twenty to thirty-four years).

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[43] See the author's analysis in "Montana Farm Foreclosures," Montana Agricultural Experiment Station Bulletin 368, February 1939.

Since American agriculture is made up of small individual enterprises, there are many debts on small variable units. Handling such debts is expensive for credit institutions, compared with the large credit flotations frequently undertaken or underwritten for industrial and commercial concerns. Consequently, the cost of credit to the farmer, in competition with these large concerns, is greater. Since returns on farm capital are comparatively low and the farmer has little control over production and price, lending on agricultural land, except under the best credit conditions and procedures, is a somewhat more risky venture than lending on many types of industrial or commercial enterprises.[44] Considerable credit for the purchase of farms is necessary because most purchasers who buy a farm for the purpose of operating it can pay only a portion of the purchase price (often as little as a fourth or less) at time of sale. In the case of business and commercial enterprises, there is a tendency for individuals to pool their funds, forming a corporate unit so that a greater amount of capital can be collected under one management and used as a means of securing further credit for expanding business operations.

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[44] The average return to farm operators for their own capital invested in farms averaged 1.9 per cent per year for the 8 years, 1924–1931. Returns during these years varied from a gain of 4.4 per cent in 1925 to a loss of 5.8 per cent in 1931. The return on total farm capital is slightly higher than this. ("Farm Credit Administration," American Institute of Banking, New York, pp. 31–32.)

The characteristics of American agriculture mentioned above are merely a few of the more important ones which indicate the need for certain specialized financial institutions to furnish necessary credit services. The Farm Credit Administration furnishes mortgage credit through its twelve farm credit districts, each district consisting of (1) a federal land bank which makes long-term mortgage loans, (2) a production credit corporation, making short-term loans, which supervises the production credit associations, (3) a federal intermediate credit bank which serves as a dependable source of funds for financing institutions making short-term and intermediate-term loans, and (4) a bank for cooperatives extending credit to farmers' cooperative associations.[45]

Credit Requirements of Forestry. Need for a comprehensive forest restoration program far more extensive than the relatively small program of the past is generally recognized. After nearly half a century of current programs, the annual cut and destruction of forests are approximately twice annual growth. An adequate forest restoration program would require ample credit for prospective investors in forest restoration. In order to provide such credit a proposal has been made to establish a Forest Credit Administration to provide credit for forestry in much the same manner as the Farm Credit Administration provides funds for agriculture.[46]

The purpose of the Forest Credit Administration would be to provide investors with direct access to the central money markets through a government-established and government-sponsored credit agency. Specific modifications from the Farm Credit Administration to meet the needs of forestry would be required for the Forest Credit Administration. For example, loans might be made for as much as one hundred years or more, and the beginning of the program of amortization might be delayed until the sixtieth year after

[45] For a more detailed statement of the organization and operation of the four major types of Farm Credit Administration banks, see the Annual Reports of the Farm Credit Administration, Government Printing Office; and American Institute of Banking, *op. cit., passim.*

[46] Conrad H. Hammar, "A Proposed Forest Restoration Credit Bill," University of Missouri, Columbia, Missouri, February 15, 1940, mimeographed.

the date the loan was made. These and other adaptations would make possible a much more comprehensive forest restoration program through private efforts than we have had in the past.

Importance of Credit Policies to Conservation of Land Resources. The operator who assumes a heavy debt obligates himself to make certain definite payments and attempts to plan his farm operations to meet them. If the debt is greatly in excess of the productive ability of his farm or business, he may be forced to use his land and improvements for the production of products or services that give him the largest immediate cash return, even though this results in depleting the land and the buildings or improvements. Under these conditions, the operator is strictly a credit tenant, and undesirable land use practices may be the result. With moderate indebtedness, the economic pressure to deplete the land and use mining practices, which is so common under the worst forms of tenancy, does not exist. Creditors have an equal responsibility with farm and business borrowers to see to it that conservation of land and improvements is facilitated by holding loans closely in line with productivity of the farm or business.

Tying up management services with the extension of mortgage credit has possibilities, if handled wisely. Including specific clauses in the mortgage stating how and for what the land and improvements are to be used, and providing some supervision as well as stipulating that failure to meet these requirements would make the loan due and payable, would help to effect improved practices. To make this practice successful, of course, both borrower and lender must be in comparatively close agreement upon land use practices and other features incorporated in the contract.

Relation of Credit Policies to Tenancy. Unwise lending policies resulting in excessive loans not only tend to bring about depletion of land and improvements, but also to increase the number of farms, businesses, and homes operated by tenants. When farmers, businessmen, and homeowners lose their property through bankruptcy or foreclosure, it is usually transferred to the creditor, who frequently operates it—at least for a period—through a tenant. Consequently, whereas wise use of credit is distinctly helpful in financing ownership and tending to reduce tenancy, unwise use of credit definitely increases tenancy.[47]

[47] Some evidence of the extent of foreclosure and the acquisition of farms by lending agencies is revealed by the fact that at the beginning of 1929 the

U. S. Real Estate Mortgage Indebtedness. Total farm and urban real-estate mortgage debt in the United States amounts to about 33 billion dollars, of which more than 27 billion (over four-fifths) is urban debt and less than 6 billion farm debt.[48] (See Figure 42.) Approximately two-fifths of all farms operated by full owners are covered by mortgages averaging more than two-fifths of their value, and more than half of all farms operated by part owners are mortgaged.[49] Nearly half the urban dwellings occupied by their

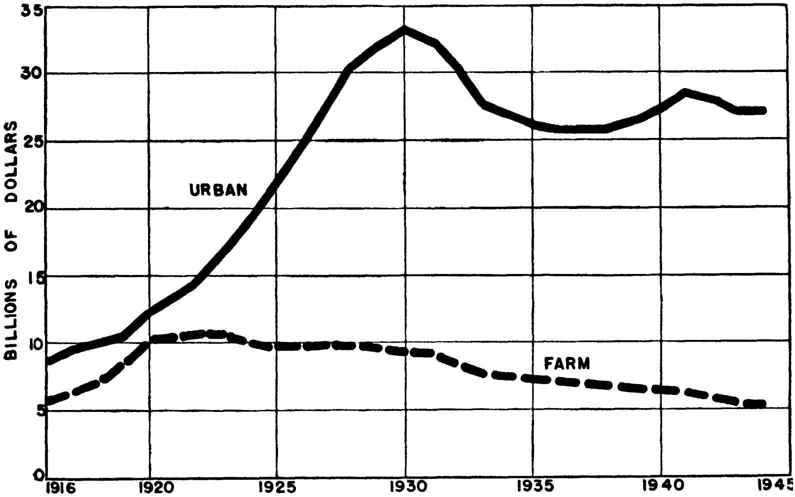

FIGURE 42 Farm and Urban Real Estate Mortgage Debt in the United States, 1916–1944. (Source: U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, *Survey of Current Business,* September, 1945, p. 14.)

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federal land banks, joint-stock land banks, life insurance companies, and three state credit agencies had an investment of almost 150 million dollars in acquired farm real estate. By 1937, this had increased to $983,284,000, involving more than 28 million acres. Most of this was held by life insurance companies. Pending sales of these properties, lending agencies must in most cases necessarily find managers or tenants to operate them. (Data secured from N. J. Wall, and E. J. Engquist, Jr., "A Graphic Summary of Agricultural Credit," U. S. Department of Agriculture Miscellaneous Bulletin 268, September 1938, pp. 3–4.)

[48] U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, *Survey of Current Business,* September 1945, p. 14.

[49] The 1940 census lists 879,288 farms, out of 3,084,138, which are operated by full owners (38.9 per cent) as being mortgaged on an average of $2,605, or 43.3 per cent of their value. Out of a total of 615,039 farms of

owners are mortgaged to the extent of more than half their value, and more than two-fifths of those occupied by tenants are mortgaged to more than three-fifths of their value.[50] Both farm and urban real-estate mortgage debt declined appreciably during the decade of the thirties. Urban debt amounted to more than 33 billion dollars and farm debt to nearly 9½ billion dollars—a total of more than 42 billion—in 1930. In 1940 the total was less than 34 billion dollars, of which 27.3 billion was urban and 6.5 billion was farm mortgage debt. Thus, the total real-estate mortgage debt declined nearly 9 billion in ten years. This decline largely represents heavy mortgage liquidation through foreclosures and distress transfers during the early thirties. During the first half of the decade of the forties, real-estate mortgage debt declined an additional 1.3 billion dollars. In 1945, the estimated total was 32.5 billion, of which 27.2 billion was urban real-estate mortgage debt and the balance (5.3 billion) was farm real-estate mortgage debt.[51]

Farm and urban mortgage debt generally tend to follow trends in farm and urban land values associated with price and income conditions. However, this is not a hard and fast rule, because a rise in mortgage debt may be associated with depressed conditions in which many owners must borrow to survive temporary low-income periods, or give real-estate security as added protection for non-real-estate loans. Conversely, a drop in outstanding mortgage debt may be associated either with an improvement of the financial position of owners which enables them to repay debts, or with depressed conditions which force many heavily indebted owners to give up their properties through foreclosure or bankruptcy or voluntary transfer to creditors in satisfaction of their debts. Changes

part owners, 320,185 (52.1 per cent) are mortgaged on an average of $3,341 per farm. Reduction of farm mortgage indebtedness from 6.5 billion to 5.3 billion occurred from 1940 to 1945 during the favorable economic and weather conditions of the World War II period.

[50] The data showing mortgage status of owner-occupied units are from the *16th Census of the United States (1940)*, "Housing," vol. IV, Part I, p. 7. The data for rented properties are based on a sample of 52 cities included in the real property inventory made in 1934. The cities were selected from every state in the Union, and vary in size from a population of 11,000 to more than 1,000,000. U. S. Department of Commerce, *Statistical Abstract of the United States; 1940,* Bureau of the Census, Government Printing Office, pp. 908–909.)

[51] U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, *Survey of Current Business,* September 1945, p. 14.

in outstanding mortgage debt, particularly over short periods, may therefore involve a combination of these various factors. The large-scale federal refinancing program of the Farm Credit Administration, the Home Owners' Loan Corporation, the U. S. Housing Authority, and other agencies, coupled with heavy public expenditures for agricultural benefit payments, relief, and work projects for the unemployed, greatly reduced foreclosures, bankruptcies, and distress transfers after 1934.

IMPROVEMENT OF MORTGAGE CREDIT POLICIES AND PRACTICES

Experience has demonstrated that credit, if used intelligently, can be an important factor in successful farm and business operations, and can help promote conservation of land resources and reduction of excessive farm and urban tenancy. However, certain fundamental principles should be followed by farm, business, and home owners and those lending on real estate, if loan experience is to be satisfactory to borrowers and lenders, and mortgage credit is to be effectively used.

Major Weaknesses of Past Real-Estate Mortgage Financing. The major weaknesses of past real-estate mortgage financing might be summarized as: (1) failure to use scientific methods of land appraisal, so that the poorer lands are usually overvalued; (2) lending a fixed percentage of the appraised value, regardless of the quality of the land; (3) using the straight-term method of repayment; (4) making comparatively short-term loans; (5) charging relatively high rates of interest; and (6) requiring fixed annual payments of interest and, in the case of amortized loans, of principal.

These are not by any means all the shortcomings of past lending policies. However, if these six weaknesses were even partially corrected, farm and urban mortgage loan experience would be much more satisfactory, and farm, business, and home operations more successful. The following suggestions indicate how this might be accomplished.

Lending on the Basis of Land Productivity. It cannot be overemphasized that the first and most important step toward more satisfactory credit practices is determination of the productivity value of the land, by the income capitalization technique supplemented with the comparative approach. One of the major causes of unsatisfactory loan experience is lending more than the productivity value of the land, so that excessive overhead and a false basis of operations are created. This tendency is particularly encouraged by the procedure of many lending agencies in lending a given percentage—say 50 per cent—of the current value as reflected by current loan appraisals and sales prices. During boom years, when land values are high, the 50 per cent lent may be more than the basic value or true productivity value of the land; whereas during depression periods, when land values are extremely low, the 50 per cent may be much less than that which could be safely lent, and may be low enough to keep the borrower from carrying out operating plans which, in themselves, may be sound and desirable.

However, after such productivity values have been determined, a concerted effort should be made to lend a smaller proportion of this value on poorer lands or sites than on higher grades. The total income from which debts can be paid is greater in relation to the capital on a good farm or business site than on a poor one.[52] In practice, of course, loans should not equal the full value of the real estate on any grade of land, because there would be no margin of security to provide for contingencies. But, if 75 per cent were the maximum lent on any grade, average loans on the poorer grades should be proportionately less. These principles apply to urban business and residential sites, as well as to farm lands.

Most lending agencies, including the federal land banks, have in practice lent the same percentage of appraised value on all grades of land in a given area. Loans have apparently been made on the theory that capital receives a residual return after labor has been reimbursed at the same rate on all grades of land. Under these conditions, the percentage of loans which have failed (as indicated by foreclosures and bankruptcies) is naturally considerably higher on lower than on higher grades. Changes in prices of products cause greater relative changes in value of land near the margin than of good land. In some cases, land near the margin declines 100 per cent in value.

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[52] Cf. A. B. Lewis, "Land Classification as an Appraisal and Credit Aid," *The Classification of Land*, Missouri Agricultural Experiment Station Bulletin 421, December 1940, pp. 68–69.

Flexible Payment Plans. Studies have revealed that short-term real-estate mortgage loans (five to ten years), loans bearing more than 6 per cent interest, and straight-term loans have tended to be the least successful. Farm incomes fluctuate widely from year to year, due to climatic and price conditions, fluctuating considerably more in some areas of the United States than in others. Under our economic system business and labor incomes also fluctuate widely, although not as much as agricultural income. It is imperative that a special effort be made to adjust loan repayments to current ability to pay. Straight-term loans for a relatively short period, at comparatively high rates of interest, are ill-adapted for this purpose. Amortized real-estate loans for a considerably longer period, at lower rates of interest, are now used much more than in the past, and give the average borrower a much better chance of paying off the loan. The total interest charges are appreciably less, and the equal annual installments are easier to meet than the lump sum which must be accumulated to pay the characteristic straight-term loan at maturity.

The equal annual installments of the usual amortized loan, however, are in terms of dollars rather than in terms of purchasing power or actual ability to pay. Such equal annual installments, in terms of dollars, do not constitute a flexible or elastic overhead. Such flexibility is particularly essential in the semi-arid sections where, as mentioned earlier, the combination of climatic conditions and one-enterprise agriculture makes farm operators especially vulnerable to fixed overhead charges. The loan contract might stipulate that the owner would pay back dollars of the same purchasing power as those he borrowed. This would require indexes of changes in production or yields, changes in the general price level, and changes in the parity position of commodities the operator produces, so that the annual loan payments could be adjusted to current ability to pay. Some other alternative proposal might be adopted.

Alternative proposals for flexible payment plans include the following: (1) The amount due each year might be limited to the landlord's rent or share of the net returns, or a fixed percentage of the returns. A variation of this plan might provide for delivering annually a payment equal to the value of so many bushels of wheat, pounds of beef, or quantity of some other product or products.

There might be years under this plan when the amount of the payment would not be sufficient to pay the interest; but if the borrower met the payment provided by the mortgage contract, he would not be considered delinquent. (2) The amount due each year might be limited to the landlord's share of the net returns, or a fixed percentage of the returns from a given source, with a minimum payment equal to the interest on the unpaid balance of the loan. (3) The amount due each year might be determined by adjusting a basic installment according to a predetermined index reflecting changes in the operator's debt-paying ability, including farm prices and production. The basic installment would represent the appraiser's estimate of the average debt service payment the operator could be expected to make over a period of years. Under this plan, the total installment called for by the formula each year would be due and payable each year; but it would be adjusted to a given relationship to the operator's income annually. Nevertheless, it would be more difficult for operators to make the adjusted payments in some years than in others. Such installments might or might not be sufficient to pay interest on the loan. (4) The same as (3) except the full amount of the accrued interest would be payable each year. (5) Various other combinations or modifications of the above.[53]

A precedent for variable payment plans has been established in the Congressional postponement of principal payments on federal land bank loans. The Farm Credit Act of 1935 stipulated that principal payments on all land bank loans outstanding on June 3, 1935, need not be met until July 11, 1938, if the loans were otherwise in good standing. The recent federal land bank policy of encouraging and accepting larger principal payments in years when farm income is high, to build up reserves for years when farm income is low, is also in line with the principle of flexible repayment.[54]

Useful as flexible payment plans are in improving farm mortgage credit practices, they are of little real value over a long period of

[53] Some of these alternatives are listed in F. F. Hill, "Flexible Payment Plans for Farm Mortgage Loans," *Journal of Farm Economics,* vol. XX, no. 1, February 1938, pp. 261–262.

[54] Cf. W. G. Murray, "Prospects for Agricultural Recovery: VI, Farm Mortgage Policy," Iowa Agricultural Experiment Station Bulletin 315, April 1934, pp. 143 ff.

time if too much has been lent on the farm, home, or business property in the beginning. In such cases, flexible payment plans would merely postpone the day of reckoning, since average payments over a period of time would be in excess of debt-paying ability. However, combined with sound practices of lending a reasonable proportion of a reasonable value based on productivity, varying with the grade of land, flexible repayment plans are effective in improving real-estate mortgage loan experience and making possible more successful farm and business operation.

Stabilizing Land Values Through Education. The preceding practices would do much to stabilize land values and real-estate investments, and improve mortgage loan experience. These two alone are inadequate to do this to the extent desirable, however, because in periods when agriculture and business are relatively prosperous, lenders are optimistic in regard to future returns and encourage farmers and businessmen to expand and take advantage of opportunities for profit. Even with an established, effective policy of lending on the basis of productivity of the land, serious consequences may result from this optimism. Too often, what actually happens is that many lenders previously not in the market to lend funds are anxious to lend, and encourage farmers and businessmen to borrow and expand. Expansion may be so widespread that the national agricultural and business plant becomes greatly overexpanded, particularly in certain products, and surpluses, low prices, and farm or business failures may result. In contrast, during periods of relatively low prices, lenders are reluctant to make loans, in view of the unsatisfactory farm and business outlook, and discourage borrowing or expanding. Thus, farmers and businessmen are deterred from buying low-priced livestock, raw materials, land, and improvements; and, since there are few ready buyers, prices are forced down still further.

Prospects for making good investments and achieving satisfactory mortgage loan experience are better when loans are made in the trough of a low-price phase than in the peak period of prosperity. It is difficult, however, to tell precisely when the trough of a low-price phase has been reached. From a national standpoint, price fluctuations could be smoothed out considerably and farm or business failures and unsatisfactory loan experiences reduced by reversing the usual loan policy and making relatively more loans during low-price periods, and relatively fewer during high-price periods. The above-discussed stipulations in loan contracts providing for repayment of loans in terms of buying power rather than in terms of dollars would actively encourage this reversal of policy.

This procedure is fair to lenders, because if loans are made when the price level is down, and are paid back when it is up, the lender will actually be repaid more dollars than he lent, but (as in the case of falling price levels) he will receive the same buying power. In effect, this procedure is used in debt adjustment cases when debts are adjusted downward to make it possible for the debtor to pay out. In sound mortgage credit policies, responsibility for the soundness of the loan should be the lender's as well as the borrower's.

A strong credit education program will be necessary to bring about agreement of thinking along these lines sufficient to have such practices incorporated in real-estate mortgage contracts. The merits of such stipulations, as well as the causes of previous unsatisfactory loan experience and the economic and social losses which bankruptcies, foreclosures, and distress transfers involve, must be thoroughly discussed and understood by borrowers and lenders in order that they may be fully enlightened in regard to the merits of certain credit practices. If this educational work is done effectively, legislation to enable local communities, through conservancy districts, zoning ordinances, or other methods to control the use of their land resources in keeping with best land use principles would probably follow. Experience and scientific investigation are making available each year a greater body of knowledge concerning uses for which land is best fitted. Legislation per se, however, is not the solution of land use problems. Laws can be repealed or enforcement made difficult or impossible if the people are not sold and kept sold on the ideas incorporated in the laws. Farm and business borrowers and lending agencies must be convinced of the need of improvements in mortgage credit practices; and if they are thoroughly convinced, the necessary legislation and changes will follow.

Mortgage Provisions for Better Land Use. Reference was made earlier to the use of clauses in mortgage contracts to assure improved management and land utilization practices. Both borrower and lender must, of course, be in close agreement regarding the desirability of features incorporated in the contract. Moreover, at least a majority of lenders and borrowers should agree on the credit practices to be followed, and on the form of the stipulations in mortgage contracts, or competition for loans may tend to reduce the effectiveness of this voluntary means of achieving desirable land use changes. The need for a widespread and thorough mortgage credit educational program, therefore, is even more apparent if desired changes are to be effected promptly and with the least possible waste of human and physical resources.

For the nation as a whole, farm and business borrowers and lending agencies are generally in a better position today than in former years to follow improved credit practices and achieve more satisfactory loan experience. Recent agricultural adjustment programs and related governmental activities, including industrial programs, are increasing annually the amount and accuracy of data on quality and character of the soil, and weather, yield, price, rent, or cost-of-production data upon which more accurate judgments of probable future conditions and long-time productivity value can be made. With the added experience of the past three decades since the great land boom of the 'teens, and the lessons learned from the unprecedented record of foreclosures, bankruptcies, and forced sales of the twenties and thirties, the fundamental principles of sound credit practices so essential for improved land use and more satisfactory mortgage loan experience should be much more widely applied in the years ahead.

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CHAPTER SIXTEEN

LAND TAXATION

Taxes are enforced contributions collected from individuals by governments for a public purpose and the common good with no return to the individual in the form of special benefits. Taxes levied on property are charges that must be met if owners are to maintain title in their property. Governments may take property, and frequently do, for failure to pay taxes levied. Widespread farm and urban tax delinquency and reversion of farm and city lands to public ownership reflect the serious problems associated with taxing land.

The tax system is an important force in determining the use and ownership of land. Too frequently, tax systems are devised on the theory that revenue should be obtained by "picking the goose where it squawks the least," without due regard to the economic consequences of such action. The amount and kind of taxes levied to obtain funds to operate government have a significant bearing upon distribution of wealth and operation of the economy as a whole. Taxes can be used as devices for encouraging conservation and proper use of natural resources, or they can be used in such a way that the rate of exploitation is increased and extreme waste of natural resources and soil impoverishment result.

PRINCIPLES OF LAND TAXATION

Many natural resources, such as scenic and climatic advantages, or access to natural transportation systems, are not easily classified. Some resources, like forest and agricultural soil fertility, are destructible, but reproducible; others, like minerals, are destructible and not reproducible; and still others—urban land sites, for instance—are neither destructible nor reproducible. This complicates the problem of land taxation if it is to contribute effectively toward a program which makes possible the best use of land resources.

Conservation is important in utilizing natural resources, which, like minerals, are destructible and not reproductive or, like forests, are destructible but also reproducible to some extent. It is generally held that certain taxes, such as ad valorem levies (taxes figured in terms of so many cents on the dollar, or in proportion to the value of the object) tend to increase the exploitation rate because owners of mineral and forest lands try to sell out from under the tax, but it is considered that severance or yield taxes tend to encourage conservation by decreasing the rate of exploitation. Taxation, however, should not be regarded as the only means of conservation. The police power, eminent domain, public ownership, and other available methods are used by governments to encourage conservation and reduce wasteful exploitation.

Origin of Land Taxes. The land tax is probably the oldest form of taxation. There were land taxes in China as early as 2000 B.C., and a tax cadaster (a record of all the facts necessary for tax assessment, such as area, type of soil, kind of crop, degree of fertility, etc.) is known to have existed in early Egypt.[1] Primitive forms of the land tax were used throughout the Middle Ages. The land tax was introduced into England in 1692, spread to most of Continental Europe, to some countries in the Far East, and to Australia. After the formation of the republic, the general property tax in the United States became the major source of state and local governmental revenue, but real estate comprised most of the property tax base, and the general property tax became, in effect, largely a tax on land and improvements.

In recent years the land tax has experienced a considerable revival (particularly in the new Central and Eastern European states established after the First World War). In this process the tax has undergone major modifications in some nations and minor changes in others. At present, land taxes are of major importance (particularly in local governmental revenues) in many nations, but provide an insignificant part of the revenue in others. In the United States, taxes on land and improvements constitute the major source of local governmental revenue. The federal government and some of the states make no direct tax levies on land or improvements.

Bases of Taxing Land. The earliest land tax was assessed on the basis of area, but modern taxes are levied on annual revenue or income from land, or on the capital value of land. Where revenue is used as a basis of assessment, the cadaster assists in estimating average yield for a given parcel of land. For accurate estimates, the land must be classified according to type of use, degree of productivity, and related characteristics. As a rule, the country is divided into assessment districts, and careful estimates are made of the productivity of typical parcels of land in each district, which are then used as the basis of estimating the probable yield of similar parcels in the same district. In order to determine net yield, production costs are often deducted from gross yield. Since these deductions are usually of a simple or arbitrary nature, the remainder is not the average net yield, but something between the gross and the net yield. In countries where tenant farming predominates, the determination of yield is simplified by using farm rentals as cadaster values. The land tax, in the form of a tax on revenue, leaves land yielding no current returns untaxed, or taxes returns incompletely in periods of rapid appreciation of real-estate values. Because of this weakness, some nations have adopted increment taxes.[2]

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[1] See Karl Brauer, "Land Taxation," *Encyclopædia of the Social Sciences*, vol. IX, p. 70.

Where assessment is based on the value of land, the usual practice is to capitalize the value of the average annual yield, or assess the tax upon the so-called current or market value. With adequate base periods for determining average yields to be capitalized, the capitalized productivity value is a more accurate index of taxable capacity than current market or sales value. As we learned in the preceding chapter, if a sufficiently long period of market values is taken as a guide, it may be an adequate index of taxable capacity. Usually, however, a combination of the two methods is most satisfactory for determining land values for tax purposes.

At the present time, land taxes in many European nations are levied on income derived from land, so that they might be referred to as "land income taxes," while in some other nations (including the United States) land taxes take the form of levies on the value of the land. For example, the income method of assessment is used in England, and the taxes (which are levied on income or rental value instead of capitalized value) are expressed as the number of shillings in the pound of land rent or income—that is, 15 shillings in the pound or a tax of 75 per cent of the land rental. In the United States, the tax is expressed as a millage levy assessed against capital value, or a given percentage of the capital value, referred to as the "taxable value."[3] In spite of the limitations of sales value as the basis for determining taxable capacity, most state statutes in the United States specify that taxable value is the price for which a property can be sold, using the willing buyer-willing seller formula, or what is commonly referred to as "market" or "exchange" value.

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[2] *Ibid.*, p. 71. Kendrick points out certain inequalities resulting from using capital values as a basis of assessment, and suggests that assessment on the basis of the net rental of the land is the only solution that even borders on completeness, using net rental to mean the current net annual market rental. If the property is not leased, this becomes estimated net rental. (M. Slade Kendrick, *Taxation Issues,* Harper, 1933, p. 72.)

Differentiation of Land Taxes. In earlier times, land taxes were strictly proportional—that is, they applied to all real property and were levied without regard to the taxpayer's personal circumstances. As such, they were strictly taxes in rem (levied in accordance with objective characteristics of the tax base, without regard to personal characteristics of the taxpayer). In more recent years, however, land taxes have been modified so that they assume more of the characteristics of a personal tax. Some of the methods used to personalize land taxes include differentiation according to the type of crop, location, kind of farming, or size of unit. Tax rates in Japan are differentiated according to the type of crop, rice fields and truck farms enjoying a lower tax rate than farms devoted to other crops. In Australia and New Zealand, differentiation is based on the size of the estate, character of tenure, and residence of owner, absentee owners being taxed at a higher rate than owner-operators.

The major purpose of land tax differentiation may be to influence land use rather than to increase revenue. For example, the taxation of land, the best use of which is for grazing at a higher rate when used for crop production tends to force the resource out of crop production into the growing of grass. In countries like Australia, where agriculture is extensive in character, differential rates have been useful in discouraging the growth of large estates, tenant farming, and absentee landlordism. Differential rates and exemptions may also be used to foster certain types of cultivation and promote land improvements such as reforestation, reclamation, or forest clearing.

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[3] The usual tax rate in the United States is from 2 to 2½ per cent of the assessment based on capital value. In England, the income method of assessment results in much higher rates, ranging from 40 to 125 per cent of assessed value. At times, tax rates in England have reached 25 shillings in the pound, or a rate of 125 per cent, meaning that the government takes in taxes more than the occupier pays the landlord. This condition is possible because the rental agreed upon between tenant and landlord takes into account the amount of the tax which the tenant has to pay, so that the combined payment to the government and the landlord will represent approximately the full lease value of the land to the tenant. (Rosina K. Mohaupt and Alger W. Lenz, "The English System for the Taxation of Real Property on an Income Basis," Social Science Research Council, Wayne University Report No. 2, Detroit, Bureau of Governmental Research Report 138, May 1935, p. 26.)

Importance of Land Taxes. Land is taxed through general imposts levied directly on real estate (particularly the general property tax), and the income tax, which reaches incomes obtained from real estate. The increasing use of income taxation has lessened the fiscal significance of land taxes, in many of the older European nations, and as revenue sources in some states of the United States. In the United States the use of the general property tax (the most important means of land taxation) is reserved to local and state governments. Some states have adopted general sales taxes and over-all tax limitation has been used in order to relieve real estate of part of the tax burden.

Prior to World War II, the property tax accounted for more than half of all federal, state, and local tax revenues in the United States; before the First World War it accounted for nearly three-fifths. Thus, while the general property tax is of less importance than formerly, it still yields more revenue than any other tax. In contrast, general property taxes in some nations provide only a minor fraction of total tax revenue.[4] The forty-eight states secure about a fifth of their tax revenue from this source. Local governments (counties, cities and towns, townships, and school districts) rely almost entirely on the general property tax, which accounts for some four-fifths of their total tax revenue.

Theoretically, the general property tax applies equally to real estate, tangible personal property, and intangible personal property, but in practice real estate comprises the bulk of the general property tax base in the United States and Canada. Considerable personal property escapes from taxation, and much of the intangible property is exempted because of the practical impossibility of collecting taxes on so evasive a source.[5]

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[4] For example, property taxes in Belgium account for $\frac{3}{10}$ of one per cent of the total tax revenue; in Switzerland, $1\frac{1}{2}$ per cent; and in Sweden, 3 per cent. In many of the major European nations, the percentage ranges from a tenth to a fifth. Only in Canada is the general property tax approximately as important as it is in the United States. (Adapted from Paul Studenski, "Modern Fiscal Systems," *Annals of the American Academy of Political and Social Science*, vol. 183, January 1936, p. 29.)

Reasons for Heavy Taxation of Land. The reliance upon the general property tax, particularly for the support of local governments, and the major importance of land and improvements in the property tax base, have placed a heavy tax burden on real estate in the United States. It is a generally accepted principle that landowners, like other individuals, should be taxed according to ability to pay. In more primitive societies, where practically all the wealth and sources of income were tangible property (largely real estate), the best single measure of this ability was amount of property owned. The general property tax was well adapted to such conditions and was widely used. This heavy emphasis has continued through the years in spite of the fact that the nature of income producing wealth has changed greatly with modern industrialization. Only about a fourth of the national income in the United States is now derived from ownership of real estate.[6]

Many believe that incomes from landed property should pay more taxes than service incomes because landowners receive more benefits from government; and that tangible property is the main beneficiary of government since such property (particularly land and improvements) requires and gains more from protection against fire and theft, foreign invasion, and similar governmental services, than do other forms of property. Furthermore, they argue that governmental services like education, highway construction and maintenance, the development and conservation of natural resources, and the establishment of health and recreational services increase the value of land by making the community a better place to live. But the question might well be asked whether these services do not directly benefit persons—professional and wage groups as well as landowners—rather than property as such.

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[5] Cf. *ibid.*, p. 31. For example, only 13 per cent of the Montana property tax base is composed of personal property (including goods, wares, merchandise, and livestock), and only 1.2 per cent of intangibles. Montana has a classified property tax law designed, among other reasons, for more complete assessment of all types of property, including intangibles. (R. R. Renne and H. H. Lord, "Assessment of Montana Farm Lands," Montana Agricultural Experiment Station Bulletin 348, pp. 44 ff.)

[6] For data showing sources of the national income, see H. G. Moulton, "Income and Economic Progress," The Brookings Institution, 1935; the Report of the Committee on Recent Social Changes, in the President's Conference on Unemployment, vol. 2, Washington, D. C., 1929; and R. R. Doane, *The Measurement of American Wealth,* Harper, 1933.

Another reason for heavy taxation of landed property is the belief that property incomes are more dependable than service incomes, because they are usually more secure and longer lived, and because property constitutes a reserve which relieves owners of the necessity of saving. There is also the element of individual effort involved in service incomes compared with property incomes, which has frequently led to reference to the former as "earned" income and to the latter as "unearned."

Property Classification and the Burden of Land Taxes. The preceding reasons explain the heavy taxation of landed property in the United States. In the analysis of agricultural and urban land taxation later in this chapter, it will be noted that there has been severe tax delinquency and reversion of much private land to public ownership through tax-deed foreclosures. Many of these undesirable results are attributable to methods of administering the general property tax. Consequently, in order to relieve the burden on farm and city real estate, important modifications in the property tax must be made.

In recent years, there has been a movement toward classification and special treatment of different kinds of property, for the purpose, among others, of adjusting taxes more in accordance with abilities to pay.[7] In general, classification has taken the form of varying ratios of assessment to true or assessed values for different classes of property. One of the more important reasons for property classification, in addition to the general purpose of adjusting taxes more in keeping with the respective abilities to pay of the different kinds of property, is to bring about a more complete assessment of intangible property like money and credits. Special classification of intangibles has resulted in a substantial increase in the amount of such property placed upon the assessment roll. However, nowhere has the increase been sufficient to constitute a good assessment.[8] In Montana, for example, the very low rate of 7 per cent of full and true value on moneys and credits has made this class of property comprise a smaller proportion of the taxable valuation of all property than before passage of the classification law.[9] Too often, what happened when the classification laws went into operation was that assessors raised assessed value to the point where the new ratio of assessment to full value would result in the same taxable value as before the classification law was enacted.

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[7] About a third of the states now have a low flat-rate tax on money and credits and Kentucky, Montana, Minnesota, Ohio, and Virginia have fairly complete systems of classification (H. M. Groves, *Financing Government*, Holt, 1939, p. 99).

[8] Cf. S. E. Leland, *The Classified Property Tax in the United States*, Houghton Mifflin, 1928, p. 403.

Although the attempt to personalize the general property tax through some system of classification is a step in the right direction, property classification has in most instances been only partially efficacious in bringing about more equitable assessment of taxes on lands and improvements. Property classification is criticized as leading to the use of political pressure and abuse; but in spite of this objection most classifications are an improvement over assessment of property as an undifferentiated mass. Property classification, however, is no substitute for scientific assessment and better administration, and many improvements in property assessment techniques will be necessary to remove the glaring inequalities that now exist within classes of property.

Homestead Exemptions. There has been a widespread tendency in the United States to exempt homesteads from taxation. During the depression of the thirties, when tax-deed and mortgage foreclosures on farm and urban lands were numerous, this movement grew. About a fourth of the states now have statutes or constitutional provisions for homestead exemptions.[10] The state statutes vary widely in their provisions. The definition of "homestead" varies from state to state but, in general, includes any dwelling occupied by the owner exclusively as a residence, and the site upon which this dwelling is located. The amount of surrounding land included varies greatly.

The fiscal effects of homestead exemption depend upon a number of conditions, including the amount of exemption and the units of government affected, the degree of home ownership, the ratio of residential property to total property, the average value of the homestead, the extent to which reliance is placed upon the general property tax as a source of revenue, and related conditions. Since the general property tax is the mainstay of local governments, any policy of widespread homestead exemptions will obviously have serious fiscal effects upon local units where farms and city homes predominate. In many of these local units, tax revenues may be cut by as much as nine-tenths, necessitating serious readjustments in the tax base. At the same time, however, where the state levies property taxes, the share of local units in county and state property taxes will be definitely reduced. The decrease of the local tax base, because of homestead exemption, will necessitate increase in property tax rates upon the remaining base, curtailment of expenditures, or substitution of new revenue sources to replace that which was lost through homestead exemption.

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[9] Renne and Lord, *op. cit.*, p. 10.

[10] Groves, *op. cit.*, p. 101.

Many arguments can be advanced for and against homestead exemption. This exemption is defined largely on the grounds that home ownership is a community asset, and should be encouraged. Excessive tenancy may develop, particularly in certain rural areas and in the slum sections of large cities, as we learned in Chapter XIV. Levying a relatively fixed amount of taxes on homes, regardless of current employment and income conditions, tends to cause serious distress and a larger amount of absentee ownership and tenancy. The homestead exemption program has had a strong political appeal in the United States, largely on the grounds that ownership of homes by individual families is both desirable and necessary in a democracy.[11]

The chief arguments against homestead exemption center around the fact that the benefits attained are inversely proportional to the need—that is, one who owns no home gets nothing. In other words, the exemption program offers nothing to the tenant. As a matter of fact, homestead exemption is likely to increase his burden insofar as increased property taxes are passed on to him by his landlords. If property tax increases result from homestead exemption because of the necessity of replacing lost revenue (rented homes would not be tax exempt), the effect of substitute taxes like the sales tax might increase the burdens of tenants and also of the poor in general (including the small homeowner).[12]

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[11] Groves points out that sentiments attached to the word "home" are deep seated, and that most politicians can arouse a following with a slogan proposing to defend the home against "the vicious tax monster." (*Ibid.*, pp. 104–105.)

[12] Only by constructive governmental economies could these undesirable results be prevented; and it is noteworthy that exemption and reorganization have rarely if ever occurred together. (Cf. *ibid.*, p. 105.)

The further argument has been advanced that it is questionable whether recipients of low and uncertain incomes should be encouraged to acquire residential property; that homestead exemption measures are extremely difficult to administer because there may be no effective impediment to nominal transfers by which individuals without a bona fide homestead will obtain tax exemption for large landowners; and, finally, that the exemption privilege will be capitalized by present owners so that future owners will pay more for residential property, thus losing whatever benefit an exemption program might offer. Some governmental units have used property tax exemptions as a means of encouraging certain types of economic activity. For instance, certain new manufacturing enterprises, residences, farm improvements, hotels, and similar economic enterprises have been granted tax exemption for a term of years. If encouraging certain kinds of economic activities at the expense of others is assumed to be justifiable, direct bounties would seem preferable to tax exemptions, since the bounty would keep the cost clearly before the public and is a more flexible tool for the purpose than tax exemption. The political advantages and apparent simplicity of tax exemptions, however, are evident.[13]

Property Tax Limitation. Property tax limitation has also been used in the attempt to control the tax burdens on farm and urban real estate. Some form of maximum rate has prevailed in most of the states for a long time; but recently, because of more real-estate tax delinquency and tax-deed foreclosures, greater emphasis has been placed upon this means of controlling the land tax burden.

Limitations upon taxes levied on property are of two main types: (1) maximum rates upon levies for certain specific purposes or by certain levels of government, and (2) over-all limits that establish a maximum aggregate property tax rate. The tax limit provisions in the different states vary widely.[14]

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[13] Carl Shoup, "Tax Exemption," *Encyclopædia of the Social Sciences*, vol. XIV, p. 530.

[14] All but about ten states have some sort of tax limit, although in a large number of these, the limits are too high, either to protect property, or, except in a few instances, to embarrass local finances. About 20 states have constitutional tax limit provisions, five of which are of the over-all type and have been adopted or amended during the depression thirties. In some states, maximum rates are established only for different levels of government or taxing units,

In addition to tax limitation provisions, many state governments control local expenditures and debts, usually through a budget system. In some states, the combination of constitutional limitations on tax levies, statutory limitations, and a strong budget system effectively control the amount of taxes levied on property (particularly land and improvements). Most tax limitation provisions permit levies in excess of specified limits by referendum (popular vote) and exempt levies to finance debt payments (principal and interest). These provisions, especially the latter, may reduce the effectiveness of property tax limits.[15]

Recent increased use of property tax limitation is a warning that the property tax system is not all it should be and is a symptom of decadence. In spite of the arguments for and against tax limitation—and there are many—the imposition of all-inclusive, rigid, negative devices from above lacks the constructive quality which should characterize revenue systems.

Net Worth Taxes. Another proposal offered to adjust land taxes more in proportion to productivity of the resource is to define taxable property not as wealth, but as the rights therein, with deductions of debts from assets. In other words, a landowner's taxable property would be his net worth. Advantages suggested for this method are that everything would be reached once, and only once. There would be no double or multiple taxation and, assuming adequate administration, nothing would escape. Under the present system, a farmer who owns a farm valued at $15,000, with a $7000 mortgage against it, is usually assessed on the $15,000 basis though his equity is only $8000. The man who holds the mortgage on the farm is often assessed on the value of the mortgage (which is a form of intangible property usually classified under the heading "money and credits") and is also supposed to pay income taxes on interest derived from such mortgages. Under the net worth basis, the farmer would be assessed on $8000 only, rather than on the $15,000.

Several European countries have adopted the net worth tax as a

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while in others, maximum rates for specific levies (as well as a maximum aggregate property tax rate) are established. (Groves, *op. cit.*, p. 461.)

[15] Groves points out that where levies to service all debts are exempted from the limit, a municipality can circumvent the limitation by borrowing freely, even for operating expenses. It can levy such property taxes as it chooses, provided it uses them to pay last year's bills. (*Ibid.*, pp. 464–465.)

supplementary tax, rather than a principal tax, with rates which are usually progressive.[16]

The net worth tax is a personal tax and bears a closer relationship to the anticipated (if not always the actual) annual income from the property of each taxpayer than does the general property tax as now administered in the United States. The net worth tax does not conform to the total ability of the landowner, because total tax-paying ability rests on aggregate income from all sources, and not only from property; thus, while it conforms to ability more adequately than the general property tax, it is still imperfect. It has the defect of all taxes levied upon capital value—that is, anticipated income, which is the basis for the capital value, may prove considerably different from actual annual income.[17]

Improvement of Property Tax Administration. It is recognized that the general property tax in its present form and administration has many weaknesses, among which are the following: (1) double taxation (where two or more units of government tax the same source); (2) inequalities in tax burdens among areas and among citizens, owing largely to (*a*) numerous small, unequal taxing units and (*b*) excessive reliance on general property taxes; and (3) expensive duplication of tax administration caused by extreme decentralization of authority. Improvement of the present revenue system requires (1) broadening the tax base, (2) classifying and assessing property more scientifically, and (3) providing for more effective central supervision and coordinated tax administration. Lack of scientific assessment, combined with too much reliance upon the general property tax, has been the paramount cause of severe burdens laid in many areas on landed property.

Consequences of poor property tax administration in increasing tax delinquency, tenancy, and unwise land use, together with suggested lines of improvement, are discussed in the following sections for each major type of land. It may be said at this point that the relatively rigid property tax levies must be applied with discretion to certain types of land and must be carefully adapted to the peculiarities of each major type of landed property. For example, the classification, assessment, and administration of the property tax in its usual forms appear to bring undesirable results not only to forest and mineral lands, but also to agricultural land, where in principle they seem more applicable. Changes that should be effected for forest and mineral land involve alterations in the timing and form of levies (as, for example, from an annual millage levy on capital value to severance or yield taxes). But the elimination of serious inequalities affecting agricultural land will necessitate more scientific classification and more centralized or integrated assessment. For urban land, standards for scientific classification and assessment need to be established.

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[16] For example, the rate in Denmark is progressive from .65 to 1.6 per cent of net value; in Iceland, from 0.1 to 0.7 per cent; and in Finland, from 0.015 to 0.8 per cent. (Jens P. Jensen, *Government Finance,* Crowell, 1937, p. 246.)

[17] *Loc. cit.*

SPECIAL TYPES OF LAND TAXES

The concept of "unearned" land rent has led to proposals for abolishing private ownership of land. The many instances of landowners who have profited immensely from community growth (especially the growth of urban communities) and of fortunes acquired overnight through the discovery of oil or valuable minerals, have encouraged the belief that all land rent essentially represents "unearned increment" (see Chapter VI). Many persons came to believe that private property should be recognized in the products of land resulting from man's work or labor, but not in the land itself, since land is not the product of labor.

The Single-Tax Proposal. Henry George proposed a tax on economic rent or land values as a means of providing government revenue. According to this theory, private property in land would be allowed but the state would appropriate the economic rent. George's proposal became known as the *single tax*, because it was assumed that the revenue yielded by the tax appropriating land rent would be sufficient to meet the fiscal requirements of government.

The most orthodox proponents of the single tax believe that the tax rate should equal the full economic rent. Others believe that, along with heavy taxes on land values, certain other taxes like income and inheritance taxes should be used. Henry George developed his case for the single tax from observations of what he considered a mistaken land policy in the new and rapidly expanding area of California. George saw that the free and rich natural resources enjoyed by a sparse population resulted in high wages and high interest which later, through profligate grants to railroads, active private land speculation, and increasing immigration, narrowed opportunities for labor and capital and finally, with the depression of the seventies, brought the unemployment and bankruptcy familiar in old communities.[18] He concluded that this sequence of events was the logical culmination of a land policy that permitted private individuals to appropriate economic rent. Such private appropriation caused speculators to hold land out of use and brought about high capitalized land values and accompanying evils which created poverty, unemployment, and bankruptcy. Henry George found confirmation of his ideas in such basic views of classical economics as the Ricardian theory of rent and the concept of natural value as contrasted with market value.

Arguments for the Single Tax. Arguments advanced for the single-tax proposal include the following: (1) If the tax were levied with such accuracy that only economic rent were appropriated, the tax would not operate to discourage individual initiative or to reduce the total income available to society. At the same time, it would provide a considerable amount of revenue which could be used for the general welfare. In Henry George's own words, "A tax on economic rent would not fall on all land; it would fall only on valuable land, and that in proportion to its value. Thus it would not have to be paid upon the poorest land in use (which always determines rent), and so would not become a condition of use, or restrict the amount of land that could be profitably used. And so the landowners on whom it fell could not shift it onto the users of the land."[19] (2) The investment necessary to become an owner of a farm or an urban site would be greatly reduced because the land would be less expensive. Government would have the equivalent of a 100 per cent mortgage on all land, and the purchase price would not be determined by capitalized actual or anticipated economic rent, but by competition of users for land as situs for labor and capital, from which would be obtained all the economic rewards of production except economic rent. (3) Speculation in land values would be almost completely eliminated, and certainly reduced. With the knowledge that the government would take away all the net income or economic rent, there would be no reason to speculate in future land value increment. (4) Reduction of speculation would tend to stabilize the price of land. (5) Confiscating the economic rent of land would remove possibilities of great fortunes or speculative gains and therefore reduce inequalities and mitigate poverty. (6) The single tax would encourage land ownership by actual operators, and increase their incentive to improve land, because no taxes would be levied on improvements. The actual operators would be the only ones interested in operating the land, because they would want land as a means of earning returns from their labor and capital—not for speculative gain, which is so frequently the aim of the absentee landlord. (7) The single tax would increase the incentive for land operators to work their land efficiently. Special efficiency would still be entitled to its reward under the single-tax program because, if administered correctly, the tax would take the economic rent but none of the special rewards of management. As a matter of fact, some argue that the single tax might force some operators to raise efficiency at least to the average in order to pay the tax. (8) The single tax would make it more expensive to hold land out of use. "A tax on land values, instead of enabling the owner to charge that much more for his land, gives him no power to charge an additional penny. On the contrary, by making it more costly to hold land title, it tends to increase the amount of land which owners must strive to secure tenants or purchasers for.[20]

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[18] Broadus Mitchell, "The Single Tax," *Encyclopædia of the Social Sciences,* vol. XIV, p. 65; and Henry George, "Causes of Business Depression," Robert Schalkenback Foundation, New York City. Reprinted November, 1936.

[19] Henry George, "Not a Tax on Land—or Labor—or Capital," Land and Labor Library, vol. I, no. 5, Henry George Tract Society, Endsell, New York.

Arguments Against the Single Tax. Perhaps the most valid criticism of the single tax is the fact that this levy is limited to the economic rent of land, though much income from many other sources is frequently unearned and should be classed in the same category. For instance, a man's parentage, fortunate qualities, and social environment may more truly account for his success than do his industry and thrift; and in the higher brackets of income, especially, it would seem that there must be a considerable portion of unearned increment to furnish a sound argument for graduated net income taxes.

A second and very important argument against the single tax is the problem of its practical application in an economy where unearned wealth, with the passage of time, has become diffused by exchange, inheritance, and similar devices. If, at the time the single-tax proposal were put into operation, the area had not yet been settled and developed, the economic injuries resulting from the use of the tax would not be great. However, in an older country where land has changed hands many times and present owners have bought the land at a price which represented the capitalized actual and anticipated net income, the single-tax levy would work a severe injustice.[21]

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[20] *Loc. cit.*

A third argument against the single tax is the difficulty of measuring economic rent accurately. In agricultural land, many improvements added by the operator's incorporation of labor and capital become part of the land itself. Commons has attempted to isolate "pure site value" or "bare land value" from land value elements like improvements, original fertility, and improved or maintained fertility, each of which, he argues, has a distinctive value.[22] From a theoretical point of view, this objective is sound, but difficult to effect in actual practice. In other words, it is questionable whether the single tax could be levied with such precision that only the economic rent would be appropriated. In any case, if the government did not buy the improvements, it would be a joint owner with the operator and would have the problem of distinguishing the return on improvements from the return on "pure site" or "bare land" value.

Fourth, the single tax flagrantly disregards the principle of ability to pay and substitutes for it another principle. The proportion of land values to total wealth greatly varies in different segments of a modern economy. For example, as much as four-fifths of the real property in a typical rural community is made up of land values, while more than half the modern property values in moderate-sized urban centers are in improvements. Under these conditions, an exemption of improvements from taxation such as that implied by the single-tax proposal would reduce the farm tax base much less than the urban tax base. Under modern financial conditions it is also probable that within certain ranges of income there is an inverse correlation between the size of a fortune and the proportion held in real estate.[23]

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[21] For example, a piece of land may have been homesteaded, sold after 25 years for $60 per acre, and a decade later sold to another individual for $100 per acre. If the single tax were put into operation, the present owner, who paid $100 an acre for the land, would find that the value of his property would shrink overnight from $100 to perhaps $5 an acre or less. The other two individuals, who secured most of the unearned increment or appreciation in value due to "community development," would not be reached by the operation of the single tax. In other words, as Groves puts it, the single tax is an attempt to "pick up spilt milk," (Groves, *op. cit.*, p. 405) and it would seem injurious to put into operation any program which would expropriate the investments of present owners who in good faith had purchased land when economic rent was privately appropriable.

[22] John R. Commons, "A Progressive Tax on Bare Land Values," *Political Science Quarterly*, vol. XXXVII, no. 1, March 1922, pp. 41–68.

Another argument against the single tax is that if the government confiscates "unearned increment" by appropriating economic rent it should reimburse the landowner for "unearned decrement." Finally, it has been argued that the single tax alone would not raise enough revenue to permit the abolition of all other forms of government revenue. But this is not an important criticism, for many proponents have in recent years realized that, with expansion of governmental services, changes in forms of property and economic activity, and slowing up of "community development and expansion," supplementary sources of revenue would undoubtedly be necessary. Income taxes and inheritance taxes would be particularly acceptable to the less orthodox single-taxers.

If the single tax could be administered in practice as it has been worked out in theory, it would not abolish the institution of private property in land, though it would, of course, seriously modify the right of the private owner. The social theory of property, however, has always recognized the tax power as a governmental right in controlling land utilization in the public interest; and the single tax is nothing more than a somewhat extreme application of this power. In contrast with the theory of individualism which underlies the single tax, the theory of social control is being used increasingly to support the cause of taxation generally. The property tax system has in the past served as a heavy tax on landed property in the United States, although in most cases it has not confiscated the entire economic rent. This system has resulted in numerous tax delinquencies and much reversion of private land to public ownership. The single tax, properly administered, would actually result in a lighter tax burden on some lands, notably the marginal and submarginal lands now so frequently overassessed, while some of the higher grades of land (particularly some of the better urban sites) would be taxed more heavily. Disregarding the serious practical difficulties involved in such sweeping tax reform, no new right of government would be involved. Taxing away the entire economic rent is merely an extension of the social theory of property and the governmental right to control private property rights in land through taxation.

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[23] A. A. Berle Jr. and G. C. Means, *The Modern Corporation and Private Property,* Macmillan, 1933; and A. A. Berle, Jr., and V. J. Pederson, *Liquid Claims and National Wealth,* Macmillan, 1934; C. F. Ware and G. C. Means, *The Modern Economy in Action,* Harcourt Brace, 1936; and other studies of the nature, forms, ownership, and control of wealth in the United States.

Land Value Increment Taxes. In spite of the wide interest aroused by Henry George's writings,[24] efforts to put into practice the entire single-tax program have met with slight success. The largest number of favorable acts have been passed in Australia, where the principles of separate valuation of land and improvements, a land tax discriminating against absentee owners, and the almost entire dependence of local revenue on land taxes are widely accepted. England in 1909 adopted a land-value increment tax, under which past increments to land value are ignored and only future increments of rent appropriated by taxation. In contrast to George's single tax (which was to be collected annually), this tax was collected only when exchange took place, and the tax base was to be the gain in land value between exchanges. In this sense, the tax resembles the capital gains features in many income tax statutes, except that it applies only to land.

The English land-value increment tax levied a tax of 20 per cent of the increment above a certain exemption. At the end of a decade, however, this tax was repealed.

Land-value increment taxes would need to be determined with due regard for the fact that future increases have been reflected to a certain extent in present land values. Properly administered land-value increment taxes would not work serious hardship on present landowners, and would tend to mitigate inequalities and increase funds available for government services or socially desirable programs. Students of land economics are generally agreed that a substantial part of future "unearned increments" could be appropriated by society to its own advantage, and knowledge of this fact is spreading, as is evidenced by the tendency of modern municipalities in various nations to levy progressive taxes on increments of private income caused by increasing economic returns from natural agents and other sources.

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[24] George's best known work is *Progress and Poverty*, first published in 1879. This book was translated into all the major tongues of Europe and by 1905 (25 years after it was first published), more than 2 million copies had been printed. With other books that Henry George wrote, some 5 million copies had been printed by 1905. Thousands of copies have been printed since that date. (See 50th anniversary edition of *Progress and Poverty*, Robert Schalkenbach Foundation, 1940, p. xii.)

Special Assessments. Special assessments are compulsory levies upon property owners to pay for special services to their property. Special assessments are justified largely on the grounds that the improvements, financed by funds obtained from the special assessments, benefit the landowner by enhancing land or property values.

There are many arguments for and against special assessments. Some students believe that land is a better base for taxation than improvements and that expenditures in the service of land usually financed through special assessments should be considered beneficial principally in making land habitable and attractive. Special assessments have a particular value from this point of view, but many problems arise in their use.

A major difficulty in the use of special assessments is the measurement of benefit. Determination of the portion of an improvement or service that should be financed from general taxes and the portion from special assessments, the territory to be included in the special assessment district, and the methods to be used in distributing costs among properties within the district all involve judgments which at best are estimates. If benefit is conceived in terms of increment to land value, the increment has to be estimated before it is realized, and events may occur to prevent its realization. Since the fundamental justification for special assessments is the equivalent increment to land value, it is extremely important to determine accurately that the improvement will increase the value of the lands that are to be specifically assessed. In actual use, however, many examples exist where special assessments have been used in spite of the fact that the improvement may not increase the value of the assessed land and in fact may actually result in a reduction in its value.[25] Closer attention needs to be paid in most instances to the amount of the special benefits involved, and where there is also considerable general benefit, special assessments should be supplemented by other more general forms of taxation.[26]

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[25] The fact that a taxpayer receives no benefit at all will not render a special assessment invalid, and the fact that the special assessment is greater than the market value of the property does not make a case for interference by a court of equity. Whatever hardship this position may involve, "must be borne as one of the imperfections of human things." *Louisville and Nashville Paving Co.* vs. *Barber Asphalt Paving Co.,* 197430, 434 (1905). (Groves, *op. cit.,* p. 423.)

Some argue that land-value increment taxes are superior as a fiscal measure to special assessments. Increment taxes are levied on increments after they arise rather than before, and include land value increases resulting from social (as distinguished from public) improvements. However, the increment tax is hardly a substitute for special assessments, which rest more logically upon the idea of special benefit than upon land-value increments.[27] Undoubtedly, special assessments will continue in wide use, particularly in municipal finance, though there is a definite tendency (especially in rural areas and in irrigation and reclamation work) to take a broader view of the nature of benefits resulting from such land improvements, and to broaden correspondingly the base of financial support for such improvements.[28] It is desirable that special assessments be maintained to permit certain groups of individuals to affect desired improvements, provided these assessments are administered efficiently, and

[26] The headlong rush of cities into unnecessary local improvements during the twenties resulted in reversion of private lots to public ownership during the depression thirties. Creation of overlapping assessment districts is widespread, some cities having imposed as many as eleven simultaneous local improvement assessments upon the same piece of property. The amount of the total assessments that can be levied against a given property should be limited by statute to a fair percentage of market value. (For these and other more glaring abuses of special assessments, together with suggested lines of improvement, see E. H. Hahne, "Special Assessments and Licenses," *Annals of the American Academy of Political and Social Sciences*, vol. CLXXXIII, January 1936, pp. 130–135.)

[27] For a more complete statement of the relative merits of the increment tax and special assessments, see E. H. Spengler, "The Increment Tax vs. Special Assessments," *Bulletin of the National Tax Association*, vol. XXI, no. 8, May 1936, p. 240.

[28] For example, the standards used to determine the economic soundness of certain irrigation projects in the West have had to be greatly modified in recent years because of the national policy of developing multiple-purpose reclamation projects to help control floods, develop low-cost hydroelectric power and navigation, and provide economic opportunities for the unemployed or returning war veterans. Until recently, it was thought that unless the farmers who were to operate the land could secure an income increase sufficient to pay the entire costs of the reclamation project, such land improvement projects should not be undertaken. Today, a considerable part—in some cases a major portion—of these costs are being met with public funds, on the grounds that provision of economic opportunities and more adequate flood control facilities justify them socially. Or, some of the costs are to be paid from sales of hydroelectric power and income from navigation.

limited to fields in which the benefits accrue only or almost entirely to the individuals involved.

Other Special Taxes on Land. George's single tax has undoubtedly been an important factor in producing certain land reforms and special land taxes effected in some areas. For example, Sidney, Australia, with a population of a million, relies entirely for its revenue upon a single land value tax, and many smaller municipalities do the same. The land in the Australian capital district of Canberra is leased from the government at its economic rent.[29]

In the city of Pittsburgh, improvements are assessed at only half their true value, while land is assessed in full (see the discussion of urban land taxation). The four western provinces of Canada have in varying degrees sought to discourage land speculation by taxation, and have required cities, villages, and towns to reduce assessments on improvements to 50 or 60 per cent of their value. In the United States, unsuccessful attempts have been made in Colorado, Oregon, California, Washington, and Missouri to ratify constitutional amendments permitting exemption of improvements and taxation of land values, but in Oklahoma a measure was passed establishing a graduated land tax with the purpose of breaking up large estates. Australia and New Zealand employ graduated land taxes for this purpose. Denmark has a national tax on the value of unimproved land, and local land taxes which are at least higher than those on improvements. In Germany, an "unearned increment" clause was included in the Weimar Constitution, but Anhalt is the only state with such a tax.[30]

When all factors are taken into account, there does seem to be a case for special taxation of land. This is particularly true of urban land; many students agree that it is doubtful whether cities should ever have allowed the sites within their boundaries to have passed entirely from public ownership, and think that if cities do not follow the course of the city of Canberra, "the next best program is to recapture a large amount of urban economic rent through special taxes on land."[31] Any such programs should be put into operation cautiously, however, because of the disruptive influences and inequalities which would result from any drastic increase in land taxation.

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[29] Mitchell, *op. cit.*, p. 66.

[30] *Loc. cit.*

[31] It is said that the city of Canberra, Australia, is being built upon land which cost the government nothing, or practically nothing. The land is not sold but leased at 5 per cent of its land value. It is revalued periodically and leaseholds for various lengths of time are auctioned off to the highest

SHIFTING AND INCIDENCE OF LAND TAXES

If taxes can be shifted so that their incidence, or "final resting place," is on someone other than the individual on whom the tax was originally assessed, the actual tax burden is different from the apparent one. For example, if land taxes can be shifted to someone else by the owner of the land, the effects of the tax on land use (through land speculation, land values, and related conditions) are substantially nullified. According to prevailing economic theory, shifting takes place only when imposition of a tax results in price changes. If there is no exchange, or price transaction, therefore, shifting cannot occur; and it is generally assumed that once a tax reaches the final consumer it cannot be shifted further, because no more transactions are involved.

Land Taxes That Cannot Be Shifted. Landlords cannot shift land taxes when they are levied as a percentage of: (1) the income from the land (but not as part of a general income tax), (2) the annual lease value (that is, the amount determined in the market as equivalent to one year's use of the land), or (3) the capital or market value—that is, the amount for which the land would sell on a voluntary buyer-seller basis. The explanation of the fact that the landlord must bear the tax in these cases is that if the land is marginal, yielding no rent, there is no tax, and hence no motive for taking it out of use, or destroying it, if that were possible. In other words, the tax does not reduce the supply of land. The landlord cannot add the tax to the rent charged the tenant, because the tax does not increase land productivity, or area, nor does it increase the supply of tenants.

If the landlord himself is using the land, he cannot charge an additional imputed rent to take into account the amount of the tax, because he would lose as tenant what he would save as landlord.

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bidder. "Whether or not one accepts all the philosophy of Henry George, one can applaud this experiment as a sensible city land policy, and an excellent method of financing government, particularly for a young city." (Groves, *op. cit.*, p. 407.) Groves goes on to say that the most important sound argument for private property in city sites is that municipal governments are too corrupt to manage a real-estate business.

If he were leasing the land for less than the full economic rent, the tax might tend to force him into charging all that could be obtained, but in the long run, he could charge no more than the maximum economic rent. Neither landlord nor tenant can shift the tax to purchasers of the products of the land, for there is no change in supply of such products or demand for them, and hence no way in which to change the price. To leave the land idle or to operate it less intensively would not shift the tax effectively, for the owner would save less than he lost.[32]

On mineral land or virgin forest land, where there are distinctly destructible properties, an annual tax may tend to increase the rate at which the resources of minerals or timber are removed. Thus, the user removes what might be considered a royalty element or source of future incomes. By immediately removing these elements from the soil and selling them, the operator saves taxes which would have been levied during the next ten, fifteen, or twenty years, and creates liquid assets immediately. In a similar way (although much less directly and completely), the fertility of agricultural lands may be removed and sold, in which case utilization yields not rent, but royalty, since the source of future income is gone. Where a royalty element is removed, the removal effects a reduction in the supply of the given type of land, and will eventually tend to raise the price of the product (a form of delayed shifting). More rapid removal of royalty elements increases the present supply of removed materials and lowers their price, so that a tax on royalty elements may constantly lower present but raise future prices; and shifting is therefore problematical.[33]

Land Taxes That Are Shiftable. One of the best examples used to indicate the possibilities of levying taxes on land so that they will be at least partially shifted is to assume a tax levied at a set amount per acre on all land in the United States. Land yielding less than this amount annually would become tax delinquent and ultimately revert to public ownership through tax deed. If the governmental unit acquiring title to these lands through tax-deed foreclosures were to leave them unused, the supply of land available for use would decrease. Prices of farm products would rise, and the tax would consequently be shifted. In actual practice, governmental units which acquire lands through tax-deed foreclosures try to sell the lands promptly to private owners, and get them back on the tax rolls. However, in many areas and for certain types of land there is a considerable lag between the time such lands come into public ownership through tax-deed foreclosure and the time they can be sold or otherwise put back into productive use. This is true on city and town lots, particularly in areas where excessive platting and subdivision have occurred ahead of the actual demand for building sites, and on the poorer grades of farm land. In some cases, such lands have gone to tax deed and remained idle in public ownership for many years.[34]

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[32] For a general statement of this argument, see Jensen, *op. cit.,* pp. 197–198.

[33] *Ibid.,* p. 198.

Obviously, land taxes most likely to be shifted are on marginal lands which they reduce to a submarginal status. In these circumstances, the lands are withdrawn from use, resulting in a decrease in production and a tendency toward an increase in the price of the product, thereby shifting the tax to the purchaser of these products. When the tax is levied on the rental of land, it is by definition only on land above the margin, and no effect upon the supply of land results. Consequently, there is no effect on price, and no shifting.

Shifting and Incidence under Special Conditions. A distinction should be made between land as such and the improvements which are incorporated into or placed upon it. In urban land, improvements are so important that the problems associated with utilizing these improvements become the major issues of urban land utilization. Buildings and other improvements, considered from the long-time point of view, are destructible, since they wear out in due time. Consequently, if taxes are levied on the value of improvements, the owner can do little to shift such taxes during the ordinary life of the improvement; but when the building or improvement needs to be replaced, the owner will not replace it unless the reward for renewal is sufficient to justify such replacement, and unless the investments promise rewards on a basis comparable with those in other alternative endeavors. In this way, the tax may definitely affect the supply, because it encourages either failure to replace the improvement, or the tendency to increase the price of products or services made possible by such improvements, resulting in a shifting of the tax. The more durable the improvement, the less adjustable the supply, and the less direct and prompt the shifting of the tax. Supply and demand conditions affecting land improvements (especially dwellings, on urban land) at the time the tax is levied, will have an important bearing upon the promptness and completeness of tax shifting.

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[34] For example, a study of tax-deeded lands, in Montana made by the author shows that more than a third of all agricultural lands reverting to public ownership because of chronic tax delinquency during the period 1870–1940 were neither leased nor sold by the county commissioners who are the supervising board for such tax-reverted lands. While these lands have not been officially in use, they have been used, nevertheless. As a matter of fact, many of them have been used excessively by operators of adjoining lands and are notoriously overgrazed and improperly used. Consequently, they contribute to the total amount of agricultural production and it is questionable if they are truly withdrawn from production, with consequent reduction of supply of agricultural products and resulting increase in price. In other words, it is very doubtful whether any significant shifting of land taxes occurs under these conditions. In the case of urban lots, however, no such unofficial use ordinarily occurs, and the tax-reverted lots are not part of the urban land supply helping to fill the demand for building sites. However, the fact that tax-reverted lots and lands are in most states required by law to be purchasable whenever a buyer offers a price which is equal or exceeds a proportion of appraised value set by the administrative authorities, means that the lands are really not effectively withdrawn from the economic supply. The moment any effective demand arises for them, they are bought or leased and put into production.

Exempting homesteads from taxation would tend to increase the desirability of all property available for owner-occupier use, and would temporarily increase the selling value of land and buildings of this character. Although competitive forces would ultimately tend to eliminate this advantage, homestead exemption would remain a special benefit and privilege for persons who chose to exercise the functions of homeowners. On the other hand, if statutory or constitutional limitation of property tax rates is effective, conditions tend to be more favorable to tax capitalization, since real estate would be a more attractive investment as a result of lower taxes, and its price would therefore be increased. Under these conditions, present owners are likely to get all the benefit of limitation of rates. Eventually, however, for the reproducible elements of real estate, like buildings and certain improvements, there would be an increase in the amount of building and improvements undertaken and this increase in supply would tend to cut down the income from improvements. However, to the extent that tax exemption or limitation of rates is applied strictly to land, the tax relief will probably be capitalized.[35]

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[35] Cf. Groves, *op. cit.*, p. 149.

Capitalization of Tax Reductions into Land Values. Many students argue that reduction of the farm tax burden will do American agriculture little good because farmers would tend to capitalize tax relief into land values, thus burdening themselves with a larger fixed overhead. The question of tax capitalization on agricultural lands cannot be answered so simply. It should not be forgotten that much of the value of farm land is derived from fertility, which is a reproducible and exhaustible factor. Taxes on fertility operate like taxes on any other reproducible item of capital used in production —that is, they tend to be shifted in increased prices of products, rather than capitalized in lower prices for land, or vice versa. Moreover, it should be remembered that in most communities, particularly in less highly commercialized farming areas, a reduction in net farm income due to taxes or an increase due to reduction in taxes may not be reflected in reduced or increased demand for farms and a reduction or increase in the price of land, because other than commercial values associated with agriculture may predominate. Finally, land changes ownership slowly in some areas, and without a fairly active market for sales and purchases, the capitalization theory cannot work effectively. The capitalization process can operate only through exchange. The owner, new or old, is left with a fixed charge from which he cannot be absolved, and any shift caused by a rise in prices may destroy enough of the producer's business, through reducing sales, to lower his net return.

The student of land economics must always analyze shifting and incidence carefully to determine direction and extent of shifting, because of the variety of forces operative in the case of each specific type of tax.[36]

TAXATION OF LAND IN DIFFERENT USES

Taxes on land and improvements in the United States are levied through operation of the general property tax. General property tax levies are the major and in most cases almost the sole support of local governmental units. In the United States, with its thousands of townships and school district units and more than 3000 county governmental units, the total tax bill on agricultural, forest, mineral, and urban lands levied through the general property tax amounts to billions of dollars annually. The machinery of general property tax administration, from assessment through tax computation and collection, is therefore of great importance to land users.

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[36] For a more detailed analysis of the general theory and application of tax shifting and incidence, see Groves, *op. cit.*, chap. VI; Jensen, *op. cit.*, chap. XII; and Kendrick, *op. cit.*, chap. V.

The General Property Tax. The general property tax as it is administered in most states places a particularly heavy burden on landowners at the very times when net income or ability to pay is comparatively low. During depression periods when prices and incomes are low, public expenditures are usually increased because of unemployment relief. During the period after a war, governmental costs are higher because of heavier debt service charges resulting from borrowing through bond issues to finance the war. In such periods, revenue from other types of taxes (especially income and sales taxes) tends to decline in comparison with total revenue required, while property taxes may not be reduced and may even be increased. Typically, revenues from all other sources are estimated first and the property tax rate is fixed at a level that will provide the remainder of the revenue required by the budget. Since land is a form of tangible property, it is particularly vulnerable during such periods to increased levies by the local governmental units which rely chiefly upon property taxes for their support. For example, it is significant that farm real-estate taxes in the United States were nearly three times their prewar level in 1930, and two and a half times their prewar level in 1931, whereas farm prices in these years were only 126 per cent and 87 per cent respectively of prewar farm prices. Although farm property taxes declined somewhat during the thirties, they were almost twice their prewar level at the beginning of the forties, whereas farm prices were slightly below their prewar level.

The trend of real-estate taxes during World War II was considerably different from that of World War I. During World War I, real-estate taxes, especially farm real-estate taxes, increased sharply (see Figure 43) because of the sharp general increase in the price level and the absence of adequate alternative sources of revenue for state and local governments. During World War II, real-estate taxes were relatively stable and farm real-estate taxes declined slightly (see Figure 43), primarily because of the increasing reliance of state and local governments upon revenues from taxes other than those on property.

Future trends in real-estate taxes will be determined in part by the relative importance of property taxes in the revenue systems of state and local governments, and in part by the amount and costs of services provided. During World War II, state and local government revenues from sales and income taxes increased with relatively high prices and incomes. These increases, together with reduced capital outlays and lower relief costs, were responsible for the accumulation of state and local governmental surpluses and the reduction in real-estate levies. The policies that governmental units adopt with reference to debt repayment, and postwar readjustment, employment, and relief will be major factors in property tax trends.

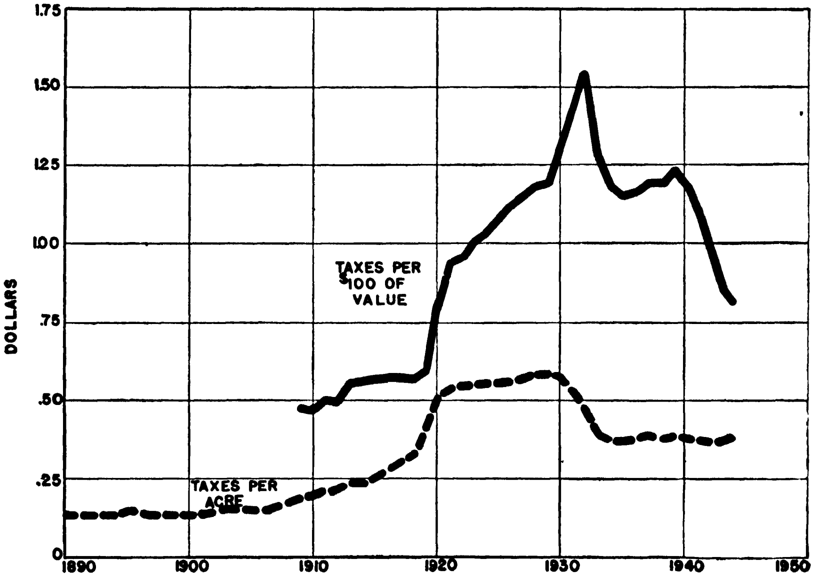

FIGURE 43. Farm Real Estate Taxes per Acre and per $100 Valuation, 1890–1944. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

Farm Tax Delinquency. The great increase in farm real-estate taxes from the beginning of the First World War to the end of the twenties and their maintenance at approximately twice the prewar level during the thirties, the continual drop in land values after 1920 to the low point of the depression in the early thirties, and the disastrous decline in farm income after 1929 made it impossible for many farmers to meet tax assessments in the thirties. Continued widespread tax delinquency, increased transfer of farms through tax-deed foreclosure, and related distress in agricultural areas have called attention to the need for fairer and more equitable farm land taxation.

Areas of high tax delinquency in the United States possess certain specific attributes which may be grouped under two major headings —a shrunken tax base, and high expenditures for public improvements.[37] Both of these characteristics cause high tax delinquency because of expenditures over and above the common ability to pay. The shrunken tax base is particularly characteristic of the cut-over counties in the Lake States, the more impoverished and depleted sections of the South, and the drought-stricken and insect-ravaged areas of the Great Plains.[38]

There are numerous causes of farm tax delinquency, many of which grow out of the economic system and the level of general business activity. Property taxes are a fixed and inescapable current cost, and the ability to pay taxes largely depends upon the amount of net income received by the landowner. During the period when American farm tax delinquency increased most, farm income was at a low level. For example, during the severe business depression and droughts of the early thirties when farm income was low and farm tax delinquency high, farm property taxes equaled approximately a tenth of gross cash farm income, or more than double the proportion of the middle twenties.[39] In contrast, during the early forties when farm income was high because of good crops and high wartime food prices, farm property taxes comprised only about 2 per cent of the gross cash farm income and farm tax delinquency was exceedingly small. The failure of rigid or inelastic farm real-estate taxes to adjust promptly and completely to changes in farm income (see Figure 44) is one of the principal causes of farm tax delinquency.

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[37] Joseph Rosa, "Some Causes of Farm Tax Delinquency," *Agricultural Finance Review*, vol. III, no. 2, November 1940, p. 11.

[38] Along the Mississippi River in the South, it is the joint burden of the property tax and drainage assessments which has caused excessive demand on the available resources. In Logan County, Arkansas, for example, in 1933, 97 per cent of the current drainage levies were delinquent. (C. O. Brannen, "Tax-Delinquent Rural Lands in Arkansas," Arkansas Agricultural Experiment Station Bulletin 311, 1934, p. 23.) In the Great Plains, it is depression, and insect pests with poorly adapted land use practices. For example, farming in areas best adapted for grazing purposes greatly increased the overhead of public service charges, particularly for education and roads, to a level above that which income obtainable from the lands justifies. In the cut-over Lake States areas, however, removal of the basic natural resource—timber—has resulted in much the same situation as the creation of ghost towns in mining areas where mineral deposits have been removed.

[39] In 1910 farm property taxes comprised only 2.9 per cent of gross cash farm income; in 1920, 3.8 per cent; and in 1925, 4.7 per cent; contrasted with 6.4 per cent in 1930 and 9.8 per cent in 1932. Farm property taxes averaged around 5 per cent of gross cash farm income for the remainder of the thirties. (Eric Englund, "Real Estate Taxation," U. S. Department of Agriculture *Yearbook*, 1940, p. 779.)

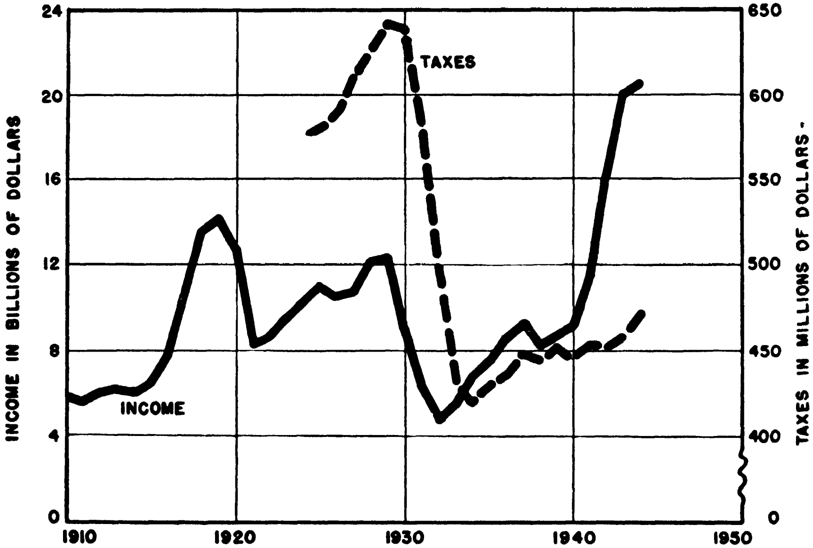

FIGURE 44. Gross Cash Farm Income and Taxes Levied on Farm Property, 1909–1944. (Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.)

There are other important causes of farm tax delinquency, aside from low farm income. One important economic factor is the tendency of current delinquency to set in motion forces which cause further delinquency. When the first lands go delinquent (perhaps because of a drop in farm prices, or crop failures, or low yields), the failure of these lands to pay their share of current government costs throws a heavier burden upon the remaining properties on the tax roll. This in turn causes some of the next poorest lands to go delinquent, throwing a still heavier burden upon the remaining properties, and setting in motion a vicious circle of tax-delinquency and tax-deed foreclosures which tends to grow for a considerable period after the original forces causing the first tax delinquency have disappeared. Another important economic cause of tax delinquency is higher operating costs and costs of living in many areas, because of increased wages and relatively high prices of the commodities farmers purchase for their living and production operations.

An important group of non-economic factors is a significant cause of farm tax delinquency. The most important of these is the administration of the tax system itself. Unless the tax system operates in such a way as to find all the taxable property, and assess it at a fair and just valuation, equality and justice will not be achieved. Studies reveal great inequalities in the property tax levied in relation to productivity of farms in various parts of the country, and within states or local tax jurisdictions. These inequalities result from present assessment methods and the degree of reliance upon agricultural lands in the property tax base. Tax collection procedures often have an important bearing upon the extent of farm tax delinquency. In some areas, much stricter enforcement methods are employed than in others, including higher charges for delinquency in the form of penalties and interest; and because of this variety of procedures, there is great variation in the extent of farm tax delinquency.[40] There is, in addition to these factors, the non-economic factor of the "standard of tax compliance," which varies greatly among individuals whose economic circumstances are quite similar.[41]

Reduction of Farm Tax Delinquency. In most cases, tax delinquency is caused by the inability of landowners to make tax payments, although it must be recognized that some taxes may remain unpaid as a protest against what the owner regards as an unfair assessment and an excessive tax burden. Since taxes are a direct out-of-pocket cost which must be met with cash, they are doubly heavy if left unpaid until the following year; and payment must be made comparatively soon to prevent loss of the farm through tax deed. Loss of land through tax-deed foreclosure, together with the discouraging effect of being burdened with disproportionate taxes when acquiring agricultural land, has contributed to a high rate of farm tenancy in many areas, particularly on low-grade farm and range lands.[42] Adjustment of assessments more in line with capitalized income or productivity value would tend to encourage ownership and conservation of agricultural lands. In many of the more marginal areas—particularly range areas—proper use is the most important single adjustment needed to increase and stabilize farm incomes; and this proper use often involves acquiring larger acreages and using land less intensively. If such land use adjustments are to be encouraged, assessment adjustments in line with proper use and productive capacity of the land are necessary.

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[40] For a more detailed analysis of the relation of tax collection methods to delinquency, see Frederick L. Bird, "Relation of Tax Collection Methods to Delinquency," in Tax Policy League, *Property Taxes; A Symposium*, 1940, pp. 254–261.

[41] Differences in tax compliance can be accounted for by one or both of two factors—a difference in degree of social responsibility, or difference in degree of devotion to property ownership. Many authors believe that during the early thirties there was a rather widespread change in attitude toward tax payments in many communities, growing out of the critical property tax situation, and that this change in attitude or "standard of tax compliance" had an important bearing upon the degree of tax delinquency in many rural communities. (Cf. Rosa, *op. cit.*, p. 14.)

Improving Farm Land Assessments. Lack of uniform assessment standards and absence of land values based on true earning power or productive capacity of the land (capitalized income value), has resulted in much overassessment, particularly on poorer, less productive grades of farm and range lands. In most states, sales values based on voluntary buyer-voluntary seller transactions are by statute assumed to be the basis for assessment values for tax purposes, but many inequalities in assessment exist. Some of the more important reasons why assessments do not correspond with sales value include: (1) failure to use voluntary sales data or any reliable information upon which assessors or deputies can base their valuations; (2) belief on the part of assessors that sales value does not represent the "full and true value" of the land; (3) necessity of making high assessments so that maximum allowable levies (many states have statutory tax limits) will yield the desired tax revenue; (4) other economic or political factors, such as lower assessments for larger and more influential property owners.

One of the first and most important steps toward reducing rural real-estate tax delinquency is the determination and use for assessment purposes of capitalized income or productivity values of agricultural lands, based on scientific soil surveys and average yields and prices. Such a system of land classification for tax assessment would tend to reduce discrepancies in tax burdens resulting from present inadequate or unscientific classifications and assessment, particularly in the case of poorer grades of farm and grazing lands.

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[42] This tendency is borne out by the fact that in some areas, particularly the low-grade range areas of the Plains, many ranch operators would rather lease their range land than own it, because of the disproportionate tax burden. Some operators have allowed all but their headquarters or water-hole sites to go delinquent and revert to public ownership, then leased lands from public agencies, on the grounds that they could lease more cheaply than they could own, and would not, at the same time, have the rigid inelasticity of overhead so disastrous during drought and low-income years.

Problems associated with classifying land for tax assessment purposes are numerous, and include those indicated in the preceding chapter on determining land values. However, the importance of developing a sound tax structure which will burden taxpayers with the support of government in proportion to their relative abilities to pay is so great, in view of the trend toward increased governmental expenditures, that the problems involved should be considered challenges, not insurmountable difficulties. Modern scientific method, combined with concerted application born of a persistent urge and desire resulting from knowledge of the importance of such improvements, should make it possible for these problems to be solved satisfactorily.

Reducing Costs of Governmental Services. Undoubtedly, farm tax delinquency could be reduced in many areas by reducing farm taxes, but such reduction would involve reduction of governmental services, or finding new sources of income, or rendering services at lower cost. All these changes have a place in a reorganized program designed to put local government on a more efficient and economical basis.

One of the first steps toward reducing governmental costs should be the improvement of the administration and organization of local governmental services, particularly in counties, school districts, and townships. Much improvement in efficiency of county services generally throughout the nation might be accomplished by centralizing administration, inaugurating the county manager, county executive, or county commission form of government. This would centralize executive responsibility and reduce the number of departments and officers. Cooperation among counties and with the state to establish a state civil service or merit system to improve personnel, to centralize purchasing of equipment and supplies, and to standardize accounting methods and forms would undoubtedly effect considerable savings in many areas. Some services, such as policing, now performed largely by individual counties, might be executed more economically and efficiently on a state-wide basis. Putting school organization and administration on a county-wide or community unit basis in many areas would reduce costs of school services and improve their quality. In many areas, particularly in the East, similar statements can be made for improvements in local township government.

In addition to these changes, more basic alterations in character of governmental services must be made in some areas to reduce costs to a level adapted to the needs and resources of the community. During recent years, the population of many communities has migrated to other areas so that the present pattern of local governmental services is now a poor fit. In some areas, especially those which are heavily in debt, adjustments in interest charges by refunding indebtedness and even write-downs of principal might be possible by concerted efforts of county officials and cooperation of creditors. County consolidation, where population has so declined that the existing county government can no longer be economically supported, might help to make tax burdens more reasonable. Combining services of various offices might result in lower governmental costs without sacrificing necessary services in many communities where consolidation of counties is not feasible. Similar adjustments in school district and township organization and administration would be beneficial in many areas.

Broadening the Tax Base. The almost complete dependence of local governments in the United States upon the general property tax places the major burden of support upon property (farm and home) owners. Broadening the tax base by shifting part of the burden to other revenue sources is desirable not only for the purpose of bringing about a more equitable allocation of tax burdens, but also to increase flexibility and thereby reduce tax delinquency.

In recent years, many state governments have tapped new revenue sources and shifted part of the tax burden away from general property. Increased emphasis on certain types of sales, income, and other taxes, might help to spread the burden of supporting government to all those who benefit from governmental services, rather than to property owners only. However, unless new taxes are adopted with caution and carefully studied as to incidence and effects, farmers may actually find themselves paying more total taxes than before. A general sales tax is regressive in its effects and tends to fall heaviest upon persons with small incomes. Moreover, farmers, most of whom buy large amounts of various kinds of products for production and for consumption purposes, would pay considerable sales taxes. Many students of public finance believe that farmers pay more than their fair share of consumption taxes. Therefore, unless newly tapped sources of revenue are restricted so as to replace specifically a given amount of property tax revenue, the farmer's tax burden may be increased rather than decreased. The problem is not as simple as the statement, "sales taxes or tax sales" implies.

Achieving Greater Flexibility of Farm Land Taxes. Present practice is for local governments to collect only enough revenue annually to meet current expenses, avoiding deficits or surpluses so far as possible. Property owners, rather than governments, are supposed to set aside cash reserves during good years, or borrow to meet tax payments in lean years. However, income fluctuations, particularly among farmers, may be so great and the periods of distress so extended in duration that any such individual savings are rapidly depleted, and borrowing becomes difficult and undesirable.

The present organization of American agriculture, with its numerous individual competing units and the general inability of farmers as a group to set prices, makes it practically impossible for most farmers to include taxes as part of their costs of production and reflect them in the selling price of their products. Even if they could include taxes in selling prices, this would be of little benefit during drought and crop-failure periods when yields are greatly reduced or vanish completely. Consequently, farm tax delinquency is large when prices and yields are low.

Some students of public finance suggest that the responsibility of adjusting finances to fluctuations in income be shifted to governmental units and tax burdens adjusted yearly to taxpayers' current incomes. Under this arrangement, when yields, prices, or wages were high, tax levies would be higher than necessary to meet current expenditures, so that a cash reserve would be built up and taxes might be reduced to less than the amount required to make ends meet when prices, yields, and incomes were at low levels. With this sliding scale of tax levies, current farm property taxes would tend to be more in line with current farm income, and rural tax delinquency would be reduced.[43] Flexibility might also be increased by supporting services like schools and roads more largely through a combination of local, state, and federal taxes, rather than predominantly through local assessments as is now so frequently the case. Federal and state governments secure a large portion of their revenues from income, sales, and related non-property taxes.

In spite of its many weaknesses, the general property tax will undoubtedly continue for some time to be the major source of local revenue, in many cases furnishing a substantial part of state revenue as well. It is a tax which can be administered more effectively by local governments than can many others. If local governments are to retain any degree of autonomy, it is desirable that they raise at least a substantial proportion of the revenue required to finance their services, or completely divorce the raising and spending of public funds. After all, if every tax were judged only by its faults, none would be acceptable. Consequently, every effort should be made to make the general property tax operate as well as possible.

Increasing Agricultural Income. The farm tax problem may be attacked from the angle of increasing farm income and, consequently, farm taxpaying ability. Increasing agricultural income would also be desirable because it would increase the income of city and town business and merchandising groups servicing agricultural communities and consequently would tend to reduce their tax delinquency. It should also help to bring about greater economic equality among farmers and other groups in society, and tend to make the economy operate more smoothly.

Improvement of land use and farm management practices would help to increase agricultural income. These require both individual and group action. The individual farmer can increase his farm income by adjusting land use to natural soil and climatic conditions, and organizing his ranch or unit for economically efficient and stable operation. Keeping accurate and systematic farm records and accounts should be encouraged. Group action is necessary to control effectively the use of land and block it into efficient units in many areas. Group action of farmers, particularly in the semi-arid sections, will permit area diversification and enable individual operators to secure higher and more stable returns. Group action is also essential for effective cooperative marketing and more effective control of prices and output. But, a broad educational and research program will be necessary before successful group action on any extensive scale will be assured for American farmers. However, if farm land assessments can be improved along the lines suggested, if local governmental costs can be reduced by more efficient administration and organization and the tax base broadened, and if farmers can improve agricultural income through individual practices and cooperative effort in production and marketing, American agriculture will be more prosperous and, incidentally, the farm tax delinquency problem will be largely solved in the process.

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[43] With such public budgeting and sliding-scale revenues, a high quality of government personnel would be required if pork-barrel methods and wasteful exploitation of surpluses in good years are to be avoided. Improvement of local government personnel through establishment of the merit system of rating and appointment, rather than extreme decentralization and popular election of many officers, would undoubtedly improve the general quality of local government administration and strengthen American democracy as a whole. It would also tend to establish government service at the local level on a professional basis.

"Wrecking Value" Taxation of Forest Lands. The administration of the property tax is chiefly responsible for problems of forest taxation. Forest land taxation policies have contributed greatly to the increase in public forest land ownership in recent years, because of chronic tax delinquency and abandonment of cut-over lands. Forest lands have not been assessed on annual productive capacity or ability to pay, but on the value which would be secured by wrecking the forest and selling the products. In other words the general property tax has been so administered that usually forest lands are assessed at their full stumpage value (value of the land and standing timber), and annual taxes have been assessed against this stumpage or "wrecking" value. The forest crop does not mature annually, and even in those cases where systematic management has resulted in cutting a given proportion of the growth each year, so as to sustain the forest on a permanent production basis, taxes have frequently equaled or exceeded annual returns. Under these conditions private forest owners have "wrecked" their properties by cutting off the entire stand, taking their profit, and abandoning the resulting cut-over tracts.

It is essential in many areas that changes be made in the methods of taxing private forest lands, if private forest ownership on a permanently satisfactory basis is to survive. Obviously, in an industry with the economic characteristics of forestry, the tax system, to operate satisfactorily, must levy taxes more in keeping with current ability of the forest owners to pay. Under the general property tax laws, timber is assessed as real estate and part of the land; but if it is to be managed to provide recurring timber crops, it must be taxed as a crop and not as real estate. Assessment, year after year, of the accumulated timber growth of many seasons does not make any distinction between the land itself, which remains, and the timber, which does not remain but is the crop or income from the capital (the land). The uncertainty of future tax levies (uncertainty in the sense of a fear of periodical increases without warning) has been one of the greatest obstacles to the practice of good forestry. Assessments naturally increase as trees approach merchantable size; and this puts pressure on the owner to market his product at the earliest possible moment, although his own interest and the public interest might be served more effectively otherwise. The principle of taxing the land annually and the timber only when it is cut and the income realized is one which students of forest economics recommend as most desirable to incorporate in forest land tax policies.

The Wisconsin Forest Crop Law makes such a distinction between land and timber, and fixes the annual land tax for 50 years, since entry of lands under the law constitutes a contract for that period between the state and the owner. The Wisconsin law fixes a tax on forest land at a figure which represents the value of the land for growing timber. For example, an acre of forest land capable of producing 200 board feet of timber yearly at a value of $5 per thousand feet would earn $1 per acre per year. The owner pays 10 cents per acre annually as a tax, which in this case equals 10 per cent of the timber produced yearly. When the timber is cut, he pays an additional 10 per cent of the stumpage value of the products removed.[44]

The annual rate of 10 cents per acre paid as an annual tax by the private owner averages considerably less than the usual taxes levied by local government on forest lands within its boundaries. However, in the Wisconsin Forest Crop Law, the state also makes a contribution to the local governments, so that the 10 cents per acre and the state contribution comprise a more satisfactory income for local governments than a growing delinquent tax list.[45] Moreover, owners of forest crop land who enter lands under the Wisconsin Forest Crop Law must pay up any unpaid back taxes before making entry, so that local governments receive appreciable sums which would have been lost if private owners abandoned their cut-over lands and allowed them to revert to public ownership.

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[44] See Wisconsin Conservation Department, "The Wisconsin Forest Crop and Woodland Tax Laws," Madison, Wisconsin, 1938, pp. 4–5.

The Principle of the Severance Tax. Payment of the 10 per cent of stumpage value of products removed when timber is cut, as provided in the Wisconsin Forest Crop Law, is in reality a severance tax. Such severance or yield taxes, in the case of natural resources like forest lands, are generally considered sound by most students of forest economics. Such a plan has distinct advantages from the point of view of the forest owner; but certain disadvantages for governments, and other difficulties arise from its use.

The principal disadvantages of such a tax plan include the necessity for state-wide administration and distribution of the proceeds among local jurisdictions. This frequently raises serious problems. Lack of a definite method of determining the rate of the yield tax is also considered a serious weakness by many. This, combined with the difficulty of adapting irregular revenue receipts to local governmental fiscal requirements, has led some students to consider the yield-tax plan distinctly inferior to other possible solutions of the forest tax problem.[46] Although the Wisconsin Forest Crop Law has not operated long enough for final judgment to be passed upon its success, it has worked sufficiently well thus far to demonstrate the distinct possibilities in such a plan of taxation, given intelligent and sympathetic understanding and support by state and local people. Under the Wisconsin plan, the local governments are assured a comparatively regular amount of annual per-acre revenue, approximately half of which comes from the state and the other half from the owner, who finds his annual payment low enough so that he can pay it, and moreover finds it good business under the fixed, fifty-year plan to do so, and "grow" his crop of trees on a permanent sustained-yield basis.

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[45] The Wisconsin Forest Crop Law provides that when funds appropriated for the state contributions to local governments are not sufficient to pay 10 cents per acre on all land, the funds must be prorated. (*Ibid.*, p. 6.)

[46] "The yield tax plan appears distinctly inferior to other possible solutions of the problem, and is therefore not recommended. The fact that after twenty years of experiment no state has yet succeeded in setting up a satisfactory yield tax of broad application is evidence of the difficulties involved." (F. R. Fairchild *et al.*, "Forest Taxation in the United States," U. S. Department of Agriculture, Miscellaneous Publication 218, October 1935, p. 638.)

In the Wisconsin law, administration of the severance tax is based upon filing with the Conservation Commission regular reports of cuttings made. Certification of cuttings is made by the owner to the Conservation Commission, or the Commission may itself determine the amounts cut. The severance tax is assessed and levied against the owner by the Tax Commission, in accordance with a stumpage schedule determined by it.

Other plans suggested for overcoming present defects of the property tax on forest land generally involve the principle of adjusting annual tax burdens more nearly to the ability of forest owners to pay currently.[47]

Effects of General Property or ad Valorem Taxation of Mineral Lands. The utilization of mineral lands is a mining or extraction business, not a crop or genetic business. Consequently, the public has a very vital interest in mineral resources, and many believe the public is entitled to a larger share of the income from mining than from genetic industries. The fact that many large mineral properties are owned by absentee owners also tends to cause relatively heavy taxation of such properties. Taxation trends, in some cases, also reflect an indirect attempt to reacquire basic natural wealth which has passed into private ownership. Supplementing these philosophical considerations is the very practical fact that deposits are immobile and cannot escape heavy taxation by moving away. Moreover, their per-acre and aggregate value is high in comparison with that of much other local property. The net result is that local taxing units in need of more revenue often tax mineral industries heavily.

The heaviest tax burden on mineral industries is imposed by state and local governments. State and local taxes are largely ad valorem on mineral reserves as well as on active mineral properties. Reserves are taxed annually, perhaps for long periods, before they come into production, and this policy affects exploitation of mineral resources much as the general property tax affects forest land. In addition to these property taxes, there are in some areas a group of special taxes on minerals called "tonnage taxes," "severance taxes," "net proceeds of mines taxes," and "royalty taxes."

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[47] For an analysis of these plans see *ibid.*, pp. 639–640.

The ad valorem or general property tax collected annually by state or local governments on all minerals, whether in production or in reserve, is the most anti-conservational of all taxes. The effects of this type of tax are viciously cumulative, forcing overdevelopment of mine capacity and generally chaotic development and extraction of mineral deposits. It puts a premium on use of the least expensive methods of extraction, in spite of the fact that such methods may ultimately lock up or permanently destroy important reserves. In addition to these vicious effects, the valuations on which ad valorem taxes are based vary widely in different localities, causing enormous tax burden disparities among individual properties, among taxing divisions, and among states. Proper valuation of mining properties is a matter requiring long experience, yet valuations in many states are determined by untrained and unqualified locally elected assessors.[48]

Suggested Improvements in Mineral Land Taxation. Many students of mineral land taxation argue that the ad valorem tax should be abolished or significantly reduced, in favor of some form of annual production or yield tax. Objections to abandoning the ad valorem tax entirely include the fact that it would favor concentration of mineral reserve ownership in very few hands, and hence put a premium on monopoly. One solution of present mineral land tax difficulties might be to assess such taxes on a scale which would make it possible for operating mines to carry reserves essential for prudent investment in plant, and yet to discourage accumulation beyond this requirement. One possible solution might be reduction or elimination of ad valorem taxes on reserves held by operating companies in amounts representing a reasonable ratio to their production. For reserves held beyond this ratio, ad valorem taxes might be maintained or even increased. This procedure might result in reversion to public ownership of many important mineral reserves which cannot be used until the distant future. State and local governments might suffer temporary loss of revenue, but this loss would be made up by various yield taxes on active mines, reasonable ad valorem taxes on the limited reserves retained by mining companies, and later might be more than equaled by collection of royalties from reserves under state ownership.[49]

Regardless of the revisions that are ultimately worked out, policies of mineral land taxation, like those of forest land taxation, need to be thoroughly revised to secure wise use of these vital resources. Certain types of mineral lands will need to be treated differently from others. The specific taxation policies adopted should be such as will fit the peculiar requirements of the particular mineral resource to achieve wise utilization.

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[48] National Resources Board, *Report to the President, 1934*, p. 427.

[49] *Loc. cit.*

Taxation of Land Used for Transportation. Streets and roads are public property and are not taxable. In the case of railroad rights-of-way, ownership is private and consequently these rights-of-way are taxable. Railroad rights-of-way cover some 4 million acres, having a value of some 3 billion dollars, while street and road rights-of-way combined, covering more than 21 million acres, have an estimated valuation (based on investment in road construction and right-of-way) of over 34 billion dollars, or more than 11 times as much as the valuation of railroad rights-of-way. With this large valuation of highway and street rights-of-way eliminated from property taxation, the amount of revenue raised by local governmental property taxes for roads and streets is appreciably reduced. In the absence of this property valuation as a source of tax revenue, other means must be provided for financing the cost of constructing and maintaining the ever growing network of streets and roads. Gasoline taxes and motor vehicle registration fee taxes have already been raised to comparatively high levels in many states.[50] County, township, and city property taxes for construction and maintenance of streets and roads are also depressingly high in many areas. The use of special assessments on contiguous property holders, to finance paving or other street improvements, places heavy financial burdens on many city dwellers. Increases in property taxes can be made in some areas, but for the nation as a whole the financing of the increasing annual burden of support of roads and streets must be borne by more widespread taxation of property or increased federal appropriations (federal aid to cities and counties, as well as to states) to reduce inequalities in tax burdens in various areas for support of the highway system.

In recent years, diversion of revenues collected specifically for highway construction and maintenance to other uses than for highway purposes has been a serious factor in reducing the amounts available for streets and roads. It has been estimated that around 20 per cent of special-user taxes, largely gasoline taxes and motor vehicle registration fees, are diverted to other purposes than roads. "Taxes by the mile" are fundamentally sound, because they constitute special service charges against motor transportation for road construction, maintenance, and administration. The registration fee has been generally regarded as a "readiness to serve" charge, while the gasoline tax is a charge based on the measure of use. Diversion of these revenues to other than highway purposes brings about far-reaching detrimental effects, including encouragement of higher motor taxes, endangering road bond indebtedness of states, jeopardizing the large investment in highways, subjecting motorists to double taxation, imposing on them as a class a disproportionate share of the cost of government, and many other serious consequences.[51]

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[50] In some of the southern states, total gasoline taxes amount to as much as 12¢ per gallon—1¢ for the federal government, 6¢ for the state, 3¢ for the county, and 2¢ for the city in which the gas is purchased. The total price of gasoline in many of these areas is less than twice the tax, or in other words the taxes represent more than half the total cost of gasoline.

Urban Tax Delinquency. Widespread urban real-estate delinquency and reversion to public ownership on a level equal to or higher than tax delinquency and tax-deed foreclosure on agricultural lands has appeared in the United States in recent years. This indicates the existence of very serious weaknesses in present urban land taxation methods. General property tax assessment procedure is one of the most significant causes of delinquency on urban as well as agricultural lands. The real property tax is the chief source of most municipal revenue in the United States, as it is in most rural local governmental units. Thus, methods of levying and administering general property taxes significantly affect the development of urban property.

Urban tax delinquency reached alarming heights during the depression thirties. Many cities had more than 40 per cent current tax delinquency, and in some, accumulated tax delinquency exceeded the current levy.[52] Heavy tax delinquency, particularly the chronic delinquency in blighted and slum areas, partially explains the fact that in February, 1933, more than 1100 local governments in 42 states had defaulted on their bonds or other obligations.[53]

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[51] See Roy F. Britton, "Taxes by the Mile," *Proceedings of the 32nd-33rd Annual Conference of the American Roadbuilders' Association, 1935-36*, National Press Building, Washington, D. C., pp. 226–236.

[52] The median tax delinquency for 450 cities of 150,000 population reached 15 per cent in 1932 and 25 per cent in 1933, declining gradually to 11 per cent by 1938. The 20 cities showing widest fluctuations in tax receipts had a median delinquency of 40 per cent in 1933. In 1938, the ratio of back taxes to current levies for 118 cities of over 50,000 population was 48.6 per cent (nearly one-half). In nine of these cities, the ratio was more than 100 per cent, and only 6 cities had a ratio of less than 10 per cent, averaging 7.2 per cent. Even arrears as low as 7.2 per cent of current levies are serious—for example,

An important cause of high urban real-estate tax delinquency is the lack of intelligent planning in development of urban patterns. This results in conditions which create high costs of rendering necessary services by the city goverment, and makes for high tax levies. For example, traffic congestion requires heavy expenditures for municipal services to direct and regulate traffic.[54] Blighted areas are unable to bear their proper share of the tax burden, with the result that a greater tax burden is laid upon other areas of the city. Moreover, the cost of providing new facilities required by people who have moved to escape from decaying or blighted areas is large. Population movement from such areas often leaves behind unused schools, libraries, and other public utilities that must be supplied at considerable cost to the new suburbs. Large apartment houses, skyscrapers, or industrial buildings which are allowed to invade residential areas require installation of high-pressure water mains for fire control, larger sewers and more expensive streets. Slums usually constitute great fire hazards, which increase the city's protection costs and raise insurance premiums of property owners. "There is hardly a single manifestation of the inefficient urban pattern that does not add its mite to the cost of municipal servicing."[55]

Another significant cause of urban tax delinquency is found in property tax assessment and administration procedures. Numerous investigations of the ratio of assessed value to market value of urban property reveal great inequalities.[56] Urban property assessment generally is very unscientific and non-uniform. Assessment is much

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the city of Birmingham's whole health and sanitation program represents only 7.1 per cent of its annual budget, while San Francisco finances all its library and recreational facilities with 7.1 per cent of its budget. (National Resources Planning Board, *Public Land Acquisition in a National Land Use Program, Part II*, p. 4.)

[53] Evans Clark, "Internal Debts of the United States," Macmillan, 1933. quoted in National Resources Planning Board, *Public Land Acquisition.*

[54] It has been estimated that traffic congestion in Manhattan costs $500,000 per day and in Cincinnati, $100,000 per day. (National Resources Committee, *Urban Planning and Land Policies*, Report of the Urbanism Committee, Government Printing Office, 1939, p. 222.)

[55] National Resources Planning Board, *Public Land Acquisition*, p. 3.

[56] Joseph D. Silverherz, "The Assessment of Real Property in the United States," New York State Tax Commission Special Report no. 10, Albany, New York, 1936.

worse in some states than in others, but a high degree of variation and regressivity is found in all states. One of the most important reasons for this is the small size of many assessing units, which justify only a part-time official and, combined with the practice of electing assessors for comparatively short terms, seriously reduces assessment efficiency.[57]

Special assessments are levied rather generally in American cities, and extensive use of this form of tax is an important factor accounting for severe real-estate tax delinquency in a great number of cities. In many cases, use of special assessments has brought about extravagance in urban improvements, excessive debt, and extreme hardships for some property owners. Although special assessments have proved useful in many areas, they should be supplemented by other taxes which will not place the entire burden of certain public improvements on owners of property contiguous to or near these improvements. In many cities, a general levy would be a more just and equitable way to defray the costs of a public improvement.

Reduction of Urban Tax Delinquency. Permanent reduction of urban real-estate tax delinquency requires a planned program of land use control and development, as well as specific revisions in the tax system. Such control is being increased through zoning ordinances and related police power and eminent domain procedures. Some specific changes in the tax system which would improve assessments and reduce delinquency include more scientific appraisal of urban real estate, and use of a graded tax plan which would assess land and improvements at different rates.

Scientific Appraisal of Urban Real Estate. Scientific appraisal of urban real estate requires the use of sound methods and adequate appraisal tools. Development of the unit rule in land valuation has been important in securing more accurate appraisals. The standard physical unit is a strip of land one foot wide and of ordinary lot depth—usually 100 feet. Front foot values based on sales data and other information are assigned for various blocks. The front half of the strip is considered more valuable than the back half, and is ordinarily valued at two-thirds of the whole. Adjustments can be made by the use of a formula for lots of greater or less than standard depth, allowing certain adaptations for corner lots.

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[57] There are nearly 16,000 assessing units in the United States, almost 2000 of which are in the state of Minnesota, 1600 in Iowa, nearly 1600 in Pennsylvania, etc. Where the county is not the assessing unit, the borough, ward, town, precinct (or even in some cases a special tax district) may be the unit of assessment. In 40 of the 48 states, assessors are elected. In 6 of these, the assessors of certain towns or cities are appointed; in 17 states, the assessor's term of office is limited to one or two years, but he may be re-elected to succeed himself. In only one state is the term longer than four years (Georgia, which has a six-year term). National Resources Committee, *Urban Planning and Land Policies*, vol. II, pp. 295–296.

The unit rule removes much of the guesswork from land assessment, but it is not equally applicable to all kinds of land, and supplementary methods must be developed to secure scientific appraisal of certain types of urban property. Zoning ordinances unthought of when the unit foot rules were first established have been adopted in recent years to stabilize land use and strengthen resistance to undesirable change. Certain modifications will be necessary in the unit foot rules of value first developed during the period when full convertibility of land was universally assumed. It is possible that the unit square foot basis may become the standard for assessment of suburban residential real estate, whenever zoning has established protection and some degree of stability.

With permanence of development as much assured as possible under modern zoning ordinances, every part of a spacious lot becomes just as important a part of the whole landscape frame of the dwelling as any other part, and the theory that the front half equals in value two-thirds of the whole is not valid. The general tendency to consider corner residential sites more valuable because of the gain in light secured by such locations may also be outmoded, because loss of privacy, sidewalk repairs, snow removal, noise of traffic, and related considerations make it a grave question whether the corner site in a properly planned and effectively zoned residential area really confers any benefit or not. In the case of industrial properties. the square foot measure is already applied even in cities where the unit front foot is used as the basic measure for all other property.

The Graded Tax Plan. In the case of city sites, where mere space is the most important attribute, land is genuinely non-reproducible, although it may to a slight extent be made more available for urban use by clearing, draining, grading, etc. The purchaser of an urban site buys an irreproducible good and he will pay for it according to its anticipated future income. If heavy taxes detract from the prospects of his anticipated profits he will pay less for the land because of them. In contrast, a tax on buildings (which are reproducible) tends to raise rents and therefore also their selling price.[58]

Out of this situation grows the important social consideration that taxes on improvements discourage buildings by reducing profits, whereas land taxes stimulate building by decreasing the price of land so that it becomes easier to acquire, and by penalizing the holder of vacant land.[59] This difference in incidence warrants a distinction between the tax treatments of urban land and of improvements. The problem of tax administration on urban real estate would be considerably reduced if taxes were levied on the land alone, and the taxpaying ability represented by income-producing improvements reached through an income tax. Building would be doubly encouraged because the tax on land would keep values down and make land easier to acquire, and elimination of taxes on improvements would also make building less difficult. Moreover, speculation in land values would be discouraged, and such procedures would be much more justifiable and equitable than present homestead exemption and related measures of granting relief to urban homeowners.[60]

The most outstanding example of differential taxation in the United States is found in Pittsburgh. Land is taxed at rates twice as high as those on improvements. Proponents of the graded-tax plan claim that the tax has stimulated building and decreased the burden on homeowners, while opponents claims that the large volume of construction in Pittsburgh during the interwar period cannot be attributed to the graded-tax law, and that the city has no advantage over other cities. Furthermore, they claim that rents in Pittsburgh in recent years have been higher than in other cities.[61] Similar differentiation of taxes on urban land and improvements is found, in varying degrees, in numerous cities of western Canada, Australia, New Zealand, South Africa, and other countries.[62]

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[58] Cf. Groves, *op cit.*, p. 135.

[59] National Resources Committee, *Urban Planning and Land Policies,* p. 305.

[60] *Ibid.*, p. 306.

[61] Thomas C. McMahon, "Pittsburgh Graded Tax on Buildings," *Proceedings of the National Tax Association, 1929,* pp. 133-140; and Edward F. Daume, "A Critical Analysis of the Operation of the Pittsburgh Graded Tax Law," *Annals of the American Academy of Political and Social Science,* March 1930, pp. 145–156.

[62] National Resources Committee, *Urban Planning and Land Policies,* p. 307.

Other Improvements. Numerous other improvements should be made in the assessment and administration of urban real-estate taxes. For example, the number of assessing units should be reduced, assessors should be appointed on a qualified basis, and more scientific and uniform methods of appraisal should be established. Improvements in organization and administration of city government, along the lines of the city manager plan, would do much to improve the efficiency and to reduce the cost of municipal services. These improvements, together with elimination of the abuse of special assessments, use of the graded tax plan, well-planned, effectively administered zoning ordinances, building and sanitary codes, and related land use control devices, would do much to make cities better places to live, and would reduce urban tax delinquency to a minimum.

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CHAPTER SEVENTEEN

CONSERVATION OF LAND RESOURCES

THE rapid settlement of the United States was accompanied by the waste and depletion of many important basic natural resources which were so abundant that neither public nor private agencies felt any great responsibility for their conservation or protection. In recent years, however, the economic and social consequences of wasteful utilization have become more apparent; and the public is now more aware of the desirability—and often the necessity—of using natural resources so as to permit a more permanently prosperous economy.

THE NEED AND NATURE OF CONSERVATION

Public interest in conservation was first aroused by the decline of fisheries and forests, but was intensified during the thirties with dust storms in the Plains, severe soil erosion and fertility impoverishment in the South and other areas, and by declines in certain types of wildlife, game, and minerals.

The Meaning of Waste. Conservation means protecting land resources against wasteful exploitation. Waste may be defined as socially uneconomic use of resources resulting from failure to combine factors of production to obtain maximum net returns, or from failure to evaluate properly social costs and benefits. Briefly, waste means failure to attain the most economic social use. Waste results in a dwarfed realization of the potential want satisfactions in natural resources.

The many forms of waste include failure to utilize natural resources or energies when available, to utilize them competently, to arrange them in appropriate forms and combinations at proper times and places, to employ them in quantities indicated by prudent use and needs, to take into consideration losses involved in certain uses, to balance present against future uses, to balance individual against collective use of resources, and to apply human intelligence effectively.[1]

The distinction between waste and loss is not simple. For instance, many pioneers moving westward in the early part of the last century cut off and burned much virgin timber in order to use the soil for producing crops. From the pioneer's point of view, and that of his contemporary generation, the immediate result is net benefit or progress, and would not be considered either waste or loss. A generation or two later, however, decreasing supplies of good timber may make it appear preferable to have preserved the forest in the interests of long-run social benefit.

Certain types of waste, particularly the more obvious kinds and those resulting from common land utilization practices, can be eliminated with planning, concerted effort, and human intelligence. In the past, there has been a considerable lag between the time when better utilization methods were developed and the time when they have been put into widespread practice. This educational lag has been a very important cause of waste, and only by greatly increasing the efficiency of the educational system can such lags be shortened.

Growing Concern over Waste. In earlier periods, when the threat of famine was very real and scarcity of many goods and services general, thrift was considered a virtue. Such a virtue, however, was regarded as an individual rather than a social matter. It is one of the paradoxes of history that serious concern over waste as a social problem developed only after society entered upon an economy of potential abundance.

Shortly after the turn of the century there developed a concern for waste as a social problem, and students of public administration focused their attention on forests, fisheries, minerals, and other exhaustible natural resources. The era of rapid economic expansion and development in the nineteenth century, and the increased rate of use accompanying the First World War took a great toll of American natural resources.

Wasteful resource utilization has not been restricted to the United States, although the rapid development of this country has helped to make consequences of wasteful exploitation more spectacular.

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[1] For these and other sources of waste see H. S. Person, "Waste," in *Encyclopædia of the Social Sciences*, vol. XV, p. 367.

Developing agriculture has greatly modified plant and animal life in various parts of the world, and has usually tended to accelerate the rate of land degradation. Great areas of formerly useful land—especially in China, North Africa, Asia Minor, and North America—have been rendered unfit for use. This has been partly caused by a declining water supply and destructive floods; but soil erosion and fertility depletion on an appalling scale are obvious in many older areas. In the United States, excellent examples of this can be seen in longer-settled areas like the southern Appalachians.

Extensive depletion of mineral resources is much more recent but no less obvious. In older districts and nations, depletion has frequently outweighed the advance of technology; a good example of this is England, which was the largest producer of coal and iron ore and the principal source of the world's copper, lead, and tin in the first half of the nineteenth century. Today, England's copper is all but gone, lead and tin are nearing exhaustion, and output of the Cumberland iron mines (the only source of rich iron ore in Britain) is steadily declining. English coal mining has now reached the stage of increasing costs, and output per man per year has been declining since 1883 in spite of increased technical knowledge and engineering skill. Competition of lands recently brought into production, where costs are declining and yields per miner are still going up, has contributed to the serious economic difficulties of English mining in recent years.[2]

Nature and Meaning of Conservation. Conservation in a narrow and restricted sense means preserving earth resources in unimpaired efficiency, or as nearly unimpaired as wise exhaustion or the nature of the particular case allows. In this restricted sense of "preservation," conservation usually involves reduction of the rate of resource disappearance, use, or consumption, and a corresponding increase in unused surplus left at the end of a given period.[3] Conservation should not be confused with "economizing," since the latter does not necessarily affect the rate of consumption, but expresses ratio of input to output, or of sacrifice to benefit. Economizing may, of course, result in conservation, depending upon the nature of the industry (whether competitive or monopolistic) and the elasticity of demand. In a price system, economizing includes all efforts to improve the economic ratio of output to input or, in social terms, to improve the ratio of benefit to sacrifice.

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[2] Cf. F. G. Tryon, "Conservation," in *Encyclopædia of the Social Sciences*, vol. IV.

[3] Zimmermann defines conservation as "any act of reducing the rate of consumption or exhaustion for the avowed purpose of benefiting posterity." See Erich W. Zimmermann, *World Resources and Industries*, Harper, 1933, p. 793.

This definition of conservation, which emphasizes curtailment of present consumption for the future, restricts economic conservation to maximization of social net returns over time. If the term *conservation* is applied to all kinds of resources, there is no alternative to using this broad definition in its economic meaning, but the definition cannot be used in a physical sense for both fund and flow resources.[4]

The three major types of resource classes (1) *fund,* or *exhaustible,* resources; (2) *flow* resources; and (3) *biological* resources—involve different problems of conservation.[5] *Fund,* or *exhaustible,* resources such as coal and oil, are limited in amount, and conservation may be defined as a decrease in the rate of consumption which will leave more available for future use. Conservation of fund resources involves higher prices in the present and may be attained best by monopolistic control.[6] The principal difficulty in determining the proper rate of use involves evaluation of the dynamic factors of technological changes and the possibilities of substitution.[7] These factors vary for each resource and consequently, the problems of conservation can be realistically approached only by a careful analysis of the physical and economic factors involved.

Flow resources occur periodically over time—such, for example, as water flow, sunshine, precipitation, and fertility from the action of solutions and organisms in the soil combined with organic matter formed by growth of roots. Conservation means using these resources in such a way that physical waste (non-use) is minimized and involves an increase in the rate of use.[8]

Biological resources of plant and animal life have characteristics of both fund and flow resources upon which they are dependent. They are unlike fund or flow resources in that their annual productivity may be decreased through exploitation, maintained at existing levels, or increased through human action. Conservation, under these circumstances, may be defined as the maintenance of the present level of productivity.[9]

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[4] A. C. Bunce, *Economics of Soil Conservation,* Iowa State College Press, 1942, p. 3.

[5] *Ibid.,* p. 4.

[6] Harold Hotelling, "The Economics of Exhaustible Resources," *Journal of Political Economy,* vol. XXXIX, no. 2, April 1931, pp. 137–175.

[7] Bunce, *op. cit.,* p. 5.

[8] *Loc. cit.*

The kind of conservation program established and its success in conserving land resources will be determined largely by two major forces: (1) the stage of industrial development of the nation—that is, status of the changing quantitative relationships of natural resources to supplies of labor, capital, and management, and the changing economic and social values of such resources; and (2) the philosophic doctrines that sanction prevailing economic institutions and culture.[10] The first of these two major forces involves all the material environment and the machinery of social control.

The Movement to Conserve in the United States. No nationwide appreciation of or movement toward conservation of natural resources developed until the latter part of the nineteenth century.[11] Attention was first drawn to the rapid decline of fisheries and forests, and the national concern caused the creation of the office of Commissioner of Fish and Fisheries in 1871. The American Forestry Association was organized by private citizens in 1875, with the purpose of promoting public appreciation of scientific forestry and timber culture; and began a movement which led to a forestry bureau in the Department of Agriculture, and to the creation of the first national forest reserve in 1891. An irrigation division (in the United States Geological Survey) organized in 1888 later grew into the Reclamation Service. The Geological Survey activities in classifying public domain resources were expanded into a Bureau of Mines in 1910. In 1892, the Yellowstone National Park timberland reserve was created by President Harrison, who set aside 13 million acres as forest reservations before his term expired. President Cleveland, who followed Harrison, withdrew 21 million more acres from the public domain and placed them in forest reserves.[12]

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[9] *Ibid.*, p. 4.

[10] Cf. R. T. Ely *et al.*, *The Foundations of National Prosperity*, Macmillan, 1918, pp. 98-99.

[11] Atwood points out that by 1670, certain towns in Massachusetts were becoming "much straitened" for building timber, and that before another hundreds years had passed, larger cities like Boston and Philadelphia were experiencing a shortage in easily available timber resources. In 1681, William Penn signed an ordinance which required that in clearing land one out of five acres should be left in trees. In 1828, John Quincy Adams, recognizing the importance of live oak timber in the construction of battleships, established a naval station in the live oak region of Pensacola, Florida, and set aside 30,000 more acres of land for the cultivation of the live oak trees. Thus a national reservation and careful, if not scientific, forestry were inaugurated; the project was abandoned, however, during the administration of Andrew Jackson. W. W. Atwood, "The Conservation Movement in America," in Parkins and Whitaker, *Our National Resources and their Conservation*, pp. 2, 3.

The conservation movement was given considerable impetus by President Theodore Roosevelt, and by Gifford Pinchot, appointed head of the Department of Agriculture's Division of Forestry in 1898. Conservation was first of all applied to forests, under the wise leadership of Pinchot, and coal came next with the Ballinger-Pinchot controversy, which hinged principally on the conservation of coal. [13] On March 4, 1907, Roosevelt appointed the Inland Waterways Commission, consisting of nine members, including Pinchot. In its first report to President Roosevelt, this commission emphasized relationships between forests, water supply, and stream flow, and pointed out how control and use of water would conserve coal, iron, and soil, at the same time contributing to necessary forest preservation.[14] The Inland Waterways Commission suggested a conference of governors of the various states; and on May 13, 1908, such a conference (known as the "White House Conference") was held. Shortly afterward, Roosevelt appointed Pinchot as chairman of the new National Conservation Commission, which was divided into four sections assigned respectively to minerals, waters, forests, and soils. In the eighteen months after the White House Conference, forty-one state conservation commissions and fifty-one conservation commissions representing national organizations were created.

President Roosevelt also organized the North American Conservation Conference, which was held in Washington on February 18, 1909. Canada, Newfoundland, and Mexico were invited to appoint commissioners to consider conservation with the United States commissioners. In the same month, he requested the world powers to meet at the Hague for the purpose of considering conservation of the earth's natural resources. In addition to bringing the question of conservation to the foreground of human consciousness, he withdrew more than 234 million acres of land from private entry during his administration.[15]

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[12] *Ibid.*, p. 4.

[13] John Ise, *The United States Oil Policy, Yale University Press,* 1926, p. 281.

[14] Van Hise and Havemeyer, *Conservation of Our Natural Resources,* Macmillan, p. 6.

[15] *Ibid.*, pp. 10–11.

In spite of Roosevelt's aggressive leadership in the matter of conservation, Congress failed to enact any legislation or appropriate any funds for the National Conservation Commission. In 1910, Charles R. Van Hise, then President of the University of Wisconsin, long a member of the United States Geological Survey, and a member of the White House Conference, published in revised form lectures delivered at the University of Wisconsin, entitled, "The Conservation of Natural Resources in the United States." This volume appeared shortly after publication of the report of the National Conservation Commission, and for many years served as the most authoritative and concise statement of the conservation problems facing the United States.

During the First World War, the conservation movement was at least momentarily sidetracked. Many state conservation commissions were not maintained, although the work they did has branched out into various fields, and some corporations and private concerns have adopted practices tending to conserve natural resources. In many states, fish and game commissions have tended to develop into strong conservation agencies protecting scarcer game and limiting the season in which other game can be hunted. Some states have made significant efforts in building up within their departments of agriculture and industry important branches or bureaus for the conservation and development of natural resources. Some corporations have developed far-sighted policies in utilizing natural resources. However, too many private concerns have taken a short-sighted view, and some resources have been exploited in a wasteful manner.

Recent Conservation Programs. Almost every President since Theodore Roosevelt has withdrawn a vast amount of land from the public domain, and this land has been carefully studied and classified for its respective uses. In 1920, Congress passed a general leasing law whereby government lands containing coal, petroleum, gas, oil shale, phosphorus, and sodium salts are to be leased on a royalty basis and not sold. The National Park Service was organized in 1916, and the national parks have been made sanctuaries where certain wild game and wildlife can live and increase undisturbed. These parks today comprise an important part of the recreational land areas of the nation.

Today the federal government, as was noted in Chapter XIV, owns a considerable acreage of lands containing important minerals, as well as a number of irrigation and power plants, millions of acres of forest lands in its forest reserves, and many acres of recreational lands, through its national parks and national monuments. From the standpoint of withdrawal of certain of these important types of land from private exploitation and waste, the conservation movement in the United States in recent years can be considered quite effective, although in many cases withdrawal movements took place too late and were very much on the order of closing the door after the horse was stolen.

From the standpoint of preventing waste in utilizing land resources, the record has been even less imposing until very recently, when as an emergency depression measure to stabilize employment, President Franklin Roosevelt embarked upon various programs, many of which were important in the field of conservation. For example, the Civilian Conservation Corps, established during the thirties, made trails, fire lanes, and highways in the national forests and removed dead timber and debris, replanting burned-over areas on a large scale in many sections. Large federal appropriations have been made since 1933 for the study of soil erosion, and for costs of an action program to eliminate it. Numerous areas have been selected for intensive experimentation, with the hope that methods would be discovered or developed that farmers could use to prevent soil erosion and fertility wastage. The TVA, financed by large Congressional appropriations, undertook construction of a number of reservoirs in the Tennessee Valley to prevent floods and increase low-cost water power available for industry and domestic use. The TVA has drawn up extensive plans for conservation of forests and soils, and is developing plans for improved utilization of all types of lands within the area. The National Resources Planning Board was appointed by President Franklin Roosevelt to inventory the natural resources of the nation and suggest plans of utilization to conserve them and stabilize employment. The AAA has tended to encourage, through its benefit payments, agricultural land utilization practices which prevent soil erosion and maintain or improve soil fertility.

Conservation measures fitted in well with the period of depression and the employment programs of the thirties. As a result, the public is much more conservation-conscious than in earlier years, and farm and ranch lands of the nation were better prepared to meet the demands of the World War II period of the early forties.

However, on many private lands and some public lands, overgrazing, erosion, and depletion of soil fertility still occur; shore-breeding species of fish are diminishing; private forests are being cut over, burned, and abandoned; wastes in bituminous coal mining average 35 per cent, 25 per cent of which is avoidable; and competitive drilling, in the case of oil production, causes formidable losses of oil and gas.[16]

The Costs of Conservation. It is generally assumed that private or personal sacrifice and postponement involved in any conservation project promises a net economic gain or at least sufficient return to cover the costs of such postponement and sacrifice. Conservation frequently involves not only postponement of possible present income and satisfaction of immediate wants, but a considerable cash outlay for taxes, interest, and upkeep of land resources.

Unless private proprietors contemplate a net economic gain, or at least a return sufficient to cover costs of postponement and sacrifice, they will not postpone or forego immediate exploitation or use, and consequently will not conserve.

The personal financial conditions of private proprietors, the present and prospective commercial value of their properties, and the uncertainties of the future are all important factors in determining whether the private user will conserve or exploit his property. If the immediate needs are not pressing, and if a sufficient monetary return from the increase in value (conservation increment) seems assured, it may be good business to save and wait. On the other hand, if financial needs are pressing and if the prospective increase in value within a reasonable time is not inviting, conservation clearly appears to be undesirable for the individual. For example, from a private standpoint, the amount that the utilizer of land can afford to spend to conserve his resources, whether agricultural, forest, mineral, or other land, is limited by the present value of anticipated returns from the expenditure. If borrowed funds are spent, the rate of interest would be an important consideration in determination of present value of future returns; while if the land user's own capital is used, the rate of interest on alternative investments must be considered.[17]

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[16] Tryon concludes that the success of the conservationists in checking wastes attributable to the competitive system is small, but that chemists and engineers have aided conservation by their improvement of technical processes. For example, in the production of lead and zinc, selective flotation and recovery of large amounts of those metals, formerly wasted because they could not be separated, have been made possible. Efficiency of utilizing coal and producing oil has been greatly increased. (Tryon, *op. cit.*, pp. 228–229.)

Rationing of credit by credit agencies may cause uneconomic exploitation, through limitation of loans or high interest rates. In the case of loans for personal expenditures, an uneconomic disinvestment may occur because the individual is unable to relate his time preference to the interest rate by borrowing. In the case of production loans, a high interest rate or limitation on the size of the loan may prevent the individual from adjusting his farming to a more profitable and conservational system.[18]

The Principle of Optimum Land Use Intensity. Land utilization, from the entrepreneurial or management point of view, is governed by the *Principle of Optimum Intensity.* Optimum intensity, we learned in Chapter V, is the point where value of the marginal unit of cost factors put into land is equal to value of the marginal unit of output from the land. By this definition, optimum intensity takes account of the economic effects of fertility or productivity depletion to the marginal increment in volume of output; or, in other words, a decrease in the present value of future income caused by the marginal output is considered part of marginal cost.[19] However, as one author points out, optimum intensity does not always require maintenance of the producing ability of land. Only if value of marginal output equals or exceeds costs of obtaining the product, plus costs of restoring productive ability lost in obtaining the product, does land conservation become an economic possibility at the point of optimum intensity.[20] Thus, the principle of optimum intensity does not in itself imply land conservation. In fact, it may mean the exact reverse, because in certain periods and localities, maintenance of productive ability, on agricultural, mineral, or any other type of land may be economically impossible and also socially undesirable. This would be true in every instance in which conservation diverts productive factors from fields in which the present value of their marginal product is higher.

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[17] Cf. Eric Englund, "What Price Conservation," *Land Policy Review,* vol. III, no 2, March-April 1940, p. 1; and Siegfried von Ciriacy-Wantrup, "Soil Conservation in European Farm Management," *Journal of Farm Economics,* vol. XX, no. 1, February 1938, p. 88.

[18] A. C. Bunce, "Society and Conservation," *Land Policy Review,* U. S. Department of Agriculture, Bureau of Agricultural Economics, vol. IV, no. 6, June 1941, pp. 15 and 16.

[19] In individual enterprises, assuming free competition and perfect foresight, optimum intensity is reached at a point where value of the marginal unit of human effort put into the land is equal to value of the marginal unit of output from land use. However, these values are not limited to monetary units. A self-sufficient family farm, for instance, places certain important valuation or utilities upon an increased supply of food, clothing, and shelter and compares with this utility or satisfaction the disutility of increasing units of work.

There is some question whether the principle of optimum intensity, with due consideration of prevailing interest rate and entrepreneurial time preference and foresight, determines the economic possibilities of land conservation for individual action. For example, although it is generally held that "maintenance of the plant is a necessity," it is true that costs of maintaining "the plant," whether in agriculture or any other industry, are important before the plant is built or acquired. Costs of maintaining a fixed plant, however, do not determine the most economic volume of output at any given time or place. Thus, in the case of individual farmers or businessmen utilizing land, the interest rate in relation to the value of the expected output would determine the degree of intensity maintained for the purpose of land conservation.[21]

Individual and Social Interests in Conservation. Even if we assume that the principle of optimum intensity determines the economic possibility of land conservation for individual action, the question arises whether it leads to desirable results for the economy as a whole. If the classical assumption of free competition and perfect foresight is employed, conservation is achieved when marginal return of a unit of a production factor invested in land maintenance equals marginal return from the best alternative use.[22] According to this concept, conservation or exploitation is economic for society when it is economic for the individual.[23] However, this assumption of harmony has been challenged on the grounds that, in reality, "we have to deal with conflicting opinions and interests between different entrepreneurs and between the members of society with regard to land use, or anything but harmony."[24] Moreover, when non-economic considerations are involved, as they necessarily are, economic grounds alone cannot be used in determining the social desirability of conservation. Reliable guidance necessitates consultation of other social sciences as well as economics.[25]

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[20] Cf. Siegfried von Ciriacy-Wantrup, "Economic Aspects of Land Conservation," *Journal of Farm Economics*, vol. XX, no. 2, May 1938, pp. 462–463.

[21] For a discussion of this point see W. J. Roth's discussion of Siegfried von Ciriacy-Wantrup's "Soil Conservation in European Farm Management," *op. cit.*, pp. 115–118, and Ciriacy-Wantrup's reply in "Economic Aspects of Land Conservation," p. 463.

[22] Cf. Walter W. Wilcox, "Measures Needed to Achieve Constant and Efficient Production," *Journal of Farm Economics*, vol XXI, no. 4, November 1939, p. 864.

Many argue that the problem of conservation arises because the interests of individual operators and society differ. For example, an individual may not desire to invest in conservation though such action may be desirable from society's point of view, because society and the individual have different time preferences. "Society," which is expected to exist in perpetuity, should have a different standard of values as between the present and future from that of the individual, whose appraisal of the future is governed by his own short span of life, and perhaps by a shadowy allowance for a generation or two of his descendants."[26]

This difference between individual time preference and social time preference indicates a conflict between the social and the individual point of view, in regard to conservation. However, time is not the only important factor determining differences in individual and social conservation activities. The concept of individual and social time preference has been used as a blanket rationalization of why society needs to act to conserve resources, but in reality it is a matter of individual judgments, freedom, and economic compulsion as against social values and compulsion. The time preference concept might be replaced with two others to explain the causes of deviation in interests between the individual and society in conservation: (1) differences between prices available to the individual and society, including interest rates; and (2) consumption values of society which are social choices society makes simply because of what the people want (recreation, scenery, etc.). Social value judgments are quite separate from individual economizing and may therefore conflict.[27] Many individuals and groups in society have divergent interests; and these conflicts of opinion and interest among the members of society necessitate compromises.[28]

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[23] "In the case where exploitation is economic for the individual when all costs have been included, it appears that it is also economic for society." A. C. Bunce, "Time Preference and Conservation," *Journal of Farm Economics,* vol. XXII, no. 3, August 1940, p. 542.

[24] Gunnar Lange, "A Neglected Point in the Economics of Soil Conservation," *Journal of Farm Economics,* vol. XXIII, no. 2, May 1941, pp. 467-468. In replying to Lange's theory, Bunce and Wilcox "appreciate that where individual and group economic interests diverge, as is conceivable in a number of cases, it would be necessary to have rules and regulations with regard to group action. In case there is a divergence of the individual's and group's economic interest, the majority must be permitted to dictate to the individual." They also point out four cases where exploitation may occur: (1) when it is economic for the individual, in which case the problem of determining whether individual and social objectives are compatible must be faced; (2) where all costs are not borne by the entrepreneur, but may be partly transferred to society or to other persons in society; (3) where custom and ignorance are involved; and (4) where rigidities in the price structure and abnormally high interest rates are involved. (A. C. Bunce and W. W. Wilcox, "A Neglected Point in the Economics of the Soil: A Reply," *Journal of Farm Economics,* vol. XXIII, no. 2, May 1941, pp. 475-477.)

[25] Cf. Bunce and Wilcox, *op. cit.,* p. 476; and Lange, *op. cit.,* p. 468.

[26] Englund, *op cit.,* p. 2.

Society usually has at its disposal superior facilities and instruments with which to predict the future. Moreover, society by its own action will influence future events much more than will actions of the individual operator, or even groups of individuals, in most cases; so that society can make better predictions as a rule. This has an important bearing upon major cost items involved in conservation—particularly prices, the rate of interest, and taxes.[29] As a result, economic plans devised by the individual and society would often be different. Even if society and the individual are influenced by the same economic motives and make use of identical accounting systems, they might arrive at entirely different land use recommendations. The individual might not accept society's recommendations without compensation.

Even if we assume a common economic maximization goal, however, private individuals and society do not use identical accounting systems. Three important differences in the cost accounting include: (1) differences between costs of exploitation or benefits of conservation (apart from capital losses) as these affect the individual and society; (2) capital losses or gains not always impinging upon the individual; and (3) differences in prices available to society and individuals.[30] For example, certain cost items in society's budget—especially labor costs—may be quite difference from those of individuals. If there is widespread unemployment, society may invest in conservation without depriving the people of present enjoyment of their buying power or the advantage of increased resources for future use. In other words, it could utilize productive power, including labor, which otherwise would be idle and perhaps need to be maintained by public expenditures for unemployment relief. Costs to society of such labor involved in a conservation program would be computed quite differently from labor costs involved in conservation programs of a private entrepreneur.[31]

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[27] These concepts are analyzed in Bunce, "Society and Conservation," pp. 15 and 16.

[28] "Such a compromise is in many instances derived from incommensurable objectives," and "seldom allows itself to be expressed in the simple mathematical symbol of a sum of individual plans, as suggested by so many economists." See Lange, *op. cit.*, p. 470.

[29] *Ibid.*, p. 471.

Individual and social net returns seldom coincide and, likewise, private and public interests in land conservation are seldom identical. Conditions essential for harmony include: (1) equality of knowledge between the individual and specialized groups providing information for the organization representing society as a whole, especially with reference to future trends and social costs and benefits; (2) this knowledge must be adequately reflected in existing prices determined under pure competition, the individual must be responsive to price in his economic activities, and all significant costs and benefits must impinge on the individual; (3) intangible ends desired by the individual must be the same as those of society as a whole, and they must be attainable by individual action; and (4) there must be flexibility in the possibilities of changing the combination of the factors of production so that adjustments in the proportions used may be attained easily in response to changes in costs, prices, and expectations.[32] The contrast of these requirements with conditions that actually prevail explains the lack of coincidence of private and public interests in land conservation.

Individual Differences in Conservation Costs. Not only are there fundamental differences or conflicts between individual or private and social points of view, plans, and programs with respect to conservation and land use, but there are important differences in time preference among individual operators within a given group in the economy. For example, one farm operator may have much better information upon which to base his expectations or anticipations than his neighbor has. As a result, he may adopt land utilization plans and practices quite different from those of his neighbors, even though he may be operating the same type and size of farm. Moreover, one operator may obtain credit on more favorable terms, and might therefore be more willing to invest in conservation. As a matter of fact, there are great variations in individual credit ratings, with especially significant differences in terms on which credit can be secured by the average individual and the large operator or corporate unit. Furthermore, the cost structure and the system of accounting and appraisal differ so much with the type of farm that significant differences would occur in the land use plans developed.

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[30] Bunce, *Economics of Soil Conservation*, p. 111.

[31] Cf. Englund, *op. cit.*, p. 3, and Lange, *op. cit.*, pp. 471 ff.

[32] For a more detailed analysis of these essential conditions, see Bunce, *Economics of Soil Conservation*, pp. 101–105.

The great variety in types of farms in the United States in certain areas, and even within major regions, necessarily results in a great variation in the conservational attitudes, plans, and programs of numerous land operators. In general, it can be said that family-sized or less commercialized operating units are ordinarily more interested in productivity maintenance and conservation practices than are large-scale commercial units. In agriculture, for example, the operator of a family-sized farm does not consider labor supplied by himself and his family as a variable cost, and therefore does not calculate net return as a business entrepreneur or the operator of a large commercial unit would count it.[33]

The case of an institutional owner or operator differs considerably from that of a private owner or operator. For example, private corporations have several advantages over natural persons, as proprietors managing natural resources subject to conservation. Some of these include: (1) the legal attribute of succession which to some extent relieves the corporation of the restrictions of a brief and uncertain term of life; (2) the relative ease with which property rights may be transferred between individual shareholders and converted into cash (liquidity); (3) the superior ability of the corporation to borrow funds, which removes its investment projects from the limitations of personal financial ability and from direct competition of private pecuniary necessities; (4) the more centralized control of a considerable portion of the supply of certain limited resources which is often sufficient to establish actual or

[33] Lange states that, in his opinion, "This is a more plausible explanation of the difference in conservation activities of the European peasants as compared with the American farmers, rather than a reference to different philosophies of life." (Lange, *op cit.*, p. 474.)

potential monopoly; (5) the ability of corporations to secure expert management which somewhat removes corporate management from the more immediate interests of private proprietorship, and should tend to reflect the social interest and public welfare. As a matter of fact, studies reveal that exploitation occurs less rapidly under monopoly than under conditions of comparatively free competition.[34]

It is obvious from these examples that determination of land use plans and conservation policies is not a simple matter in the case of the individual land operator.

Economic Conservation and Economic Exploitation. It is economic for the individual to exploit rather than conserve resources when the cost-price structure is such that exploitation will maximize individual returns. Moreover, exploitation frequently occurs when the individual can transfer some of his cost to society, or to other operators or individuals.[35] Exploitation may also occur when the individual, motivated by custom rather than intelligence, exploits resources to his own and society's loss. Exploitation may also grow out of a whole gamut of restrictions and inflexibilities in the cost-price structure, including exaggerated land values, rigid tax levies, high interest charges, "sticky" prices due to unequal monopolistic

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[34] Harold Hotelling, *op. cit.* This does not mean that private and public monopolies would achieve identical results, because private and public output policies would differ with differing objectives. However, if private monopolies are compared with numerous competing private firms, the monopoly is in a position to adjust supply more effectively to demand and, as a result, may have an entirely different scale of cost and price relationships. In many cases, adjustment of supply to demand involves a holding back or restraint on production or use of the resource and the resulting output, compared with the uncontrolled larger output and faster rate of use of the resource which tends to occur under competition.

[35] Bunce gives a typical example of this in the case of a tenant farmer who may increase his current income at the expense of the capital investment of the landlord to whom he has transferred the resulting loss. "If the landlord takes no steps to protect his interests, society is justified in taking action when the loss suffered by the landowner is greater than the gain obtained by the tenant." (Bunce, "Time Preference and Conservation," p. 539.) Another example might be the situation where, because of very seasonal employment, large numbers of workers are thrown on relief and unemployment rolls and society stands the cost of supporting these workers during the months when there is no private employment available. This way, exploitation may appear economic when actually it may be uneconomic, if responsibility for taking care of the labor supply so that it would be available at the times private operators needed it were to be paid entirely by operators. An example of this type of exploitation is seasonal sugar beet labor in sugar beet growing areas.

influences in various segments of the economy, or any other conditions which prevent the price system from adequately reflecting supply-demand relationships, or institutional factors interfering with the operation of a flexible exchange economy. These forces might cause the individual operator to utilize land resources so as to obtain an urgently needed income in the present, even though a large future loss might be involved.[36]

From the social point of view, the limit of "economic exploitation" (exploitation justifiable on economic grounds from an individual point of view) is often in the decrease of returns from the land to a zero level. Decrease of return from virgin land—or, with most natural resources, including ore deposits and forests, with increased use or exploitation—proceeds rapidly at first, declining gradually until an ultimate standstill is reached. In the case of agricultural land, the English Rothamsted Experiments show that returns are nearly stable when fertility depletion reaches a point where accretions of plant food released by climatic environment and natural physical processes of weathering just equal the decrease in fertility caused by removing the yearly crop. This may be referred to as the "economic base level of exploitation." Any increase in output, or reduction of output decline above this base level, would necessitate increased input and would be determined by the equilibrium of marginal input and marginal returns.[37]

Limits and Permanency of Destructive Exploitation. In actual practice, however, destructive exploitation frequently proceeds much beyond the "economic base level of exploitation," and has actually resulted in reducing output to nothing, also setting in motion destructive forces which have wiped out "permanently" the possibility of growing crops. In this way, both present and future generations are excluded from exploiting soil productivity. A distinction should be made between *fertility depletion* and *soil deterioration*. *Deterioration* implies a loss in the value of the soil as production capital, and permanently reduced rent to the owner, and higher prices to consumers. *Fertility depletion,* on the other hand, represents use of resources that can be replaced later at a cost equal to or below the costs of maintaining them, and no permanent decrease of physical productivity and rent occurs.[38]

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[36] Bunce points out that, from a research point of view, it is important to determine where conservation is economic and where exploitation is economic. He points out that this is a complicated task involving an analysis of net returns under private and social management, capital losses, and costs of changing from one system to the other, as well as an analysis of social costs not borne by the entrepreneur. (*Ibid.*, pp. 539 ff.)

[37] Cf. Ciriacy-Wantrup, "Economic Aspects of Land Conservation," p. 468.

Many pioneer land utilization practices in the period of American expansion and development seem extremely uneconomic and wasteful today, though they were economic at the time. The significant fact is that the relative scarcity of some of these land resources, in comparison with human resources, has changed. The question arises whether it would not have been "economic" for society to have put into effect certain plans and programs which would have prevented such destructive exploitation.

In many cases, society might very well have been justified in trying to conserve land. Many argue that society is justified in investing efforts for land conservation only under conditions where the interest rate and expected future returns would make it impossible for individuals to do so, and that the interest rate best applicable to society—namely, the current rate on government bonds—should always be used in computing these costs. The gravest mistake, in the minds of many students, is the creation of some sort of "cost-free" land economics in order to make proposed actions appear economically desirable when they are not, although these actions may be of great social value from other aspects and may deserve consideration for that reason.[39] In other words, economic considerations alone are not sufficient grounds upon which to base plans for social action concerning conservation of land resources. To try to justify certain social actions or programs strictly on economic grounds is both unscientific and unnecessary. The use of an interest rate permits rational accounting of alternative social expenditures. Just because a conservation expenditure does not pay is no reason why it should not be made if society wants it, and the use of the interest rate merely tells how much each project costs so that we have a better basis of choice.

[38] See Rainer Schickele, "Economics of Agricultural Land Use Adjustments, 1. Methodology in Soil Conservation and Agricultural Adjustment Research," Iowa Agricultural Experiment Station, Research Bulletin 209, March 1937; and Bunce, *Economics of Soil Conservation,* pp. 14–17.

[39] This argument is advanced in Ciriacy-Wantrup's "Economic Aspects of Land Conservation."

Desirability of Social Action to Achieve Conservation. As a rule, the amount which individual land operators can afford to spend in conserving their land resources is limited by the present value of anticipated returns from expenditures. In other words, the cost-price structure and future expectations are important factors determining how much the private operator can spend. Thus, private land operators frequently find it uneconomic to safeguard future productivity, with the result that "economic exploitation" prevails. In other words, it does not pay or is not "good business" for the individual to practice conservation. Is society governed by the same factors and in the same manner, or are there other considerations which justify public expenditures for conservation investment aside from the strictly economic, or those which govern operators of individual entrepreneurs?

Social action to achieve conservation is desirable: (1) when it would be economic for the individual operator to conserve but he fails to do so; (2) when conservation is not economic for the individual but is economic for society; and (3) when intangible ends desired by a majority in a democracy can be achieved only by collective action.[40] Under the first condition, social action is justified because it will increase both individual and social net returns. Society could well expend funds so long as they resulted in increasing the social net income—funds that in ordinary times would probably be limited to education, and perhaps subsidies for specific improvements. Under the second condition, a sound public policy and action program can be formulated only when the basic reasons are understood by individuals continuing an exploitive system when it is not economic for them to do so and results in lower net returns than could be obtained from a conservation system.[41] Society is justified in taking steps to eliminate such exploitation, but the action program should be directed at the basic causes operating in the area. Under the third condition, typical examples of intangible ends that have high value to society but have no way of expressing themselves through the pricing system are camping and picnic areas, natural scenic beauty destroyed by billboards, virgin forest strips on highways, and recreational values of hunting and fishing. Conservation of such values reflects thinking of the people on broader than solely economic terms.

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[40] Bunce, *Economics of Soil Conservation,* p. 105.

[41] Bunce lists some of the more obvious causes of this condition, including custom, lack of knowledge, insecurity of tenure, and rationing of credit. (*Ibid.,* pp. 107-111.)

Society, through wise financial management, may invest in conservation without depriving the people of present enjoyment of buying power or increased resources for future use. This could be true particularly during periods in which capital and labor are idle, if public financing of conservation resulted either directly or indirectly in putting to work productive power—including labor, capital, land, and management—which would otherwise be idle and necessitate heavy unemployment relief expenditures. Moreover, certain classes of resources, as we noted earlier, if not used, are forever lost to society, and public expenditures for development and utilization of these resources are justified.

The question of how much society can afford to spend for conservation ignores the fact that much conservation can be cost-free and implies that whatever is spent for conservation is withdrawn from current consumption or investment in some productive enterprise; but this condition would exist only if there were no idle funds, idle resources, or idle labor, or if all these resources were employed in a way which would be more productive of public good than their employment in conservation work. So long as a conservation program can be financed with public funds so that part or all of these idle resources will be used without diverting purchasing power from present consumption or, in other words, without necessitating curtailment in present consumption in order to insure a greater abundance of natural resources in the future, there is no limit to the amount which society is justified in spending on conservation. Society is justified in going beyond the point where only idle resources, funds, labor, or equipment are utilized in the conservation program, if resources put to work directly or indirectly as a result of expenditures substantially match the conservation effort.[42]

It is obvious that society can afford to spend much more for conservation programs in some periods than in others. It is also obvious that methods utilized to secure public funds to finance conservation programs are an important factor in determining the point beyond which society is not justified in spending for conservation, since they determine the incidence of the burden for financing such programs. In any case, students of land economics should acknowledge that the price society can afford to pay for conservation is not governed

[42] Cf. Englund, *op. cit.*, pp. 4 ff.

solely by the usual theoretical analysis of present value of future monetary returns, using some assumed rate of interest, but also by the social values which a given society (assuming perpetuity) must take into account, together with the extent to which the real cost of conservation can be met by using productive resources that otherwise might be wasted through unemployment or non-use. To this end, it is necessary to finance conservation on a budget basis definitely providing for ordinary periods of surplus and deficit financing, in accordance with years of relative prosperity and depression. Thus, conservation work should be made a part—in some cases perhaps the major part—of a systematic public works and government spending program.[43]

Methods of Achieving Conservation. The amount and kind of land conservation which would ordinarily develop through private initiative in the search for economic gain would not adequately serve the needs of society. Conservation would occur only in areas where it was economic and, because of inertia, ignorance, custom, and similar forces, might not occur even in these areas; whereas the social interest, because of social values or the relative prosperity or depression status of the economy, might justify much more extensive conservation programs. Under these conditions, conservation would involve some degree of government regulation; and where government regulation is involved, there is more or less conflict between public and private interest. Regulative policies may take two main forms—education and compulsion. Subsidies or benefit payments may be used to achieve desired goals, but these could be classified as a type of economic compulsion.

Education has important possibilities as a stimulus to conservation. It could tend to make people aware of the importance of conservation, and could furnish them information which would assist them in making future plans and commitments. In many cases, a strong educational program calling attention to the need for conservation and the social losses involved in excessive exploitation and waste would cause many people to effect conservation practices which would not necessarily give them an economic reward. They would spend money for conservation as they spend money for other instruments of public welfare. However, for a large portion of the people, mere knowledge of the facts is not enough to assure establishment of a practical conservation program.

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[43] For a more complete development of this argument see Englund, *op. cit.*

In order to overcome ignorance and inertia, the educational program must be sufficiently strong and long-continued to develop a social philosophy, so that desire to conserve becomes part of the people's institutions, customs, and thinking. Moreover, education is essential for enforcement and maintenance of some of the more compulsory methods of securing conservation, such as statutes, ordinances, rules, and regulations. It is essential that such educational work be accomplished before or at least simultaneously with the enactment of compulsory regulations if they are to be most effective. If a social philosophy favorable to conservation is firmly established, changes in the rules of the game through changes in statutes and ordinances will follow logically. Without such a social philosophy, passing a law will effect very little sound conservation.

Compulsory regulation to establish and maintain land use control can be accomplished in many ways, including exercise of the police power and operation of the taxing power of government. Control of land use in the interests of conservation through the police power (the authority vested in the government to restrict certain uses of private property and private contract when their exercise jeopardizes the public health, safety, morals, or general welfare) may be achieved by zoning ordinances or conservation districts. Taxation, although ordinarily considered as a means of providing revenue for the support of government, can effectively control the conduct of persons in the possession, use, and disposition of property.

Conservation Policies. Use of police and taxing powers may be inadequate to secure the amount and type of land conservation most desirable for the general welfare. Much can be accomplished under certain conditions by public assistance in the form of economic rewards to private individuals for conservation practices. Such public assistance can be justified on the grounds that private owners are performing a service of public as well as private benefit; and where conservation is not economic from the private entrepreneur's point of view, such public assistance is generally necessary if any widespread conservation is to be effected. In the United States, benefit payments to individual farm operators under the AAA for certain soil-building and soil-conserving practices are a good example of the use of public assistance in securing conservation of agricultural land resources. The federal government lays down rules and regulations under which it will grant the individual rewards or payments, the arrangement taking the form of a cooperative agreement or contract between the individual land operator and the government, with certain rights and duties established for each. The limits to which the government is justified in spending for conservation, including public assistance of this sort, have already been discussed.

Use of police power, the taxing power, and public assistance are very important in achieving land conservation; the combined effect, however, of all of these devices may be inadequate. The alternative to private conservation of land resources is public ownership, and many students of land economics feel that some land resources, particularly those which are scarce, necessary, and of potentially great social value, should always remain in public ownership subject to private uses socially feasible at any given time. For certain types of land uses, where conservation is particularly uneconomic from a private entrepreneur's standpoint (especially those in which a long period of time is involved) the government can most advantageously undertake conservation through public ownership. However, public ownership, per se, is no guarantee that land resources will be conserved. For example, tax-reverted lands in many areas are often without any management, with the result that the lands are overgrazed or exploited by private entrepreneurs. In the forest reserves, however, the federal government has played an active role in controlling use of the lands, and has followed a sound conservation program.

In recent years, the federal government has purchased considerable acreages of so-called submarginal lands in the Great Plains, on the grounds that such purchase and control were necessary to effect the long-time reseeding and grazing improvement programs desirable on these lands. Local governments and private individuals did not have resources or prospects of economic returns sufficient to induce them to undertake such a venture. Except for certain types of land, particularly those considered submarginal for uses which would be made of them under private operation, and for certain types of land of strategic importance to the general welfare, most students of land economics agree that public ownership should be considered a last resort, not to be used until police power, taxing power, and public assistance procedures have been exhausted. However, society should always insist that reasonable use of lands be required as a condition of private title.

It should be kept in mind at all times that the central public purpose in using land is to sustain, on a comparatively permanent basis, the highest possible level of living. Best land use, therefore, means not only improved living conditions, but improvement maintained on a relatively permanent basis. In order to achieve improvement in living conditions or attain the highest possible level of living, land must be put to its highest and best use. If this is done, the conservation problem will be solved because highest and best use implies attaining the highest level of living possible on a comparatively permanent basis. Problems arising from failure to put land to its highest and best use will be discussed in the following pages under each major type of land, together with suggested lines of action toward achieving highest and best use, and consequently toward conserving the land resources of the nation.

SOIL CONSERVATION

The land's ability to support the plant and animal life involved in agriculture is determined by soil fertility, which refers to the whole complex of external factors influencing plant growth at a given time and place, including texture and biological status of the soil, as well as chemical nutrients necessary for plant growth.[44] The vital importance of the top few inches of soil to successful production of plant growth and to support of human life through agriculture makes it essential that this mantle of soil be utilized so as to prevent serious deterioration. In many parts of the globe, practices followed in cultivating soil or using it for production of plants and animals have not maintained soil fertility or producing ability. In some cases, populations have had to move because of declining land productivity; and in many areas, even where settlement has been comparatively recent, ghost communities and ghost farms spot the countryside.

Agricultural land is partly a fund resource, partly a biological resource, and partly a flow resource. This complicates the problem of conserving agricultural land. Agricultural production may utilize the stored-up fertility of thousands of years, or the fertility annually renewed through flow resources combined with current receipts of moisture and energy. Agricultural productivity may be built up by man over time. Conservation of agricultural land involves maintenance of fund resources and the present level of productivity of the soil, assuming a given state of the arts.[45]

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[44] Cf. Ciriacy-Wantrup, "Soil Conservation in European Farm Management," pp. 87–88.

How Soil Fertility is Lost. Man is unable to make any significant direct changes in climate, physical relief, or the geological character of the parent rocks from which soil is formed; but he may change the character of the natural vegetation rather profoundly through his activities, and in this way indirectly exert considerable influence upon soil development and fertility. Vegetation is the strongest of the forces producing soils, and in general the action of vegetation is constructive, whereas the action of climate on soils is generally destructive. Of the two major groups of vegetation, however, grass is more effective in building soils than is forest vegetation. The most important of man's crops are grains, which belong botanically to the grass group. Consequently, man-made changes of vegetation during land settlement and use are usually less destructive than would be the case if most crops were selected from forest plants.[46]

In many instances, when man changes a forest vegetation to crop vegetation he actually improves the character of the soil. Native character of the soil, slope of the land, and other conditions, however, may often cause serious soil losses which would not have occurred under a forest economy. Under natural conditions, soil is covered with forests, grasses, or shrubs, which preserve it by breaking the force of rains, checking flow of surface water, and holding soil in place. Vegetative cover also protects soil from the wind—an extremely important function in dry areas— and decomposition of the vegetative covering adds humus to the topsoil. This provides still further protection against washing and blowing, and increases the water-holding capacity of the soil. Thus, vegetative cover under natural conditions may ordinarily be thought of as a blanket, covering or tying down the top mantle of soil.

Because vegetation is the strongest of the natural forces which produce soils, the type of farming practiced and its influence on the type and character of vegetation are important factors determining extent of fertility losses. Soil fertility or plant nutrients may be lost or removed from the soil in four important ways: (1) by erosion—namely, wearing away of lands by washing or by wind action; (2) by removal of crops which have drawn plant food out of the soil into themselves in process of growth; (3) by leaching, or percolating of water downward through the ground carrying plant food beyond the reach of vegetation; and (4) by volatilization.[47] Ordinarily, erosion and crop removal account for the greatest losses in soil fertility. Certain systems of farming cause a considerable portion of the earth's surface to be exposed in a loose form particularly subject to erosion. Some types of crops require much more plant food than others. Although leaching and volatilization are ordinarily of minor importance and determined mostly by natural forces, leaching is influenced by irrigation practices in areas where water is applied artificially. If excessive irrigation water is applied on certain types of soils, considerable loss of plant nutrients results because of severe washing out of the mineral salts, while in some areas where drainage is particularly poor, excess water may collect in low spots and evaporate, leaving the soil so saturated with additional mineral salts that fertility is greatly reduced.

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[45] Cf. Bunce, *Economics of Soil Conservation*, p. 7.

[46] See C. F. Marbut, "Soils," in *Encyclopædia of the Social Sciences*, vol. XIV, pp. 250–251.

Cropping Systems and Soil Fertility Losses. Continuous removal of crops without replacing chemical elements which they extract will greatly impair productivity on most soils. The most important plant nutrients readily removed by cropping are nitrogen, calcium, phosphorus, and potassium.[48] Humus, or organic matter (the carrier of nitrogen) is important in determining soil structure and stimulating chemical action creating plant food. Organic matter is frequently destroyed by overcropping as well as by erosion.

Of all plant nutrients, phosphorus is the "crucial one," for the following reasons: (1) for most soils, phosphorus deficiency imposes a greater limitation on crop production than deficiency of any other mineral element; (2) in relation to need, world supplies of recoverable phosphorus are more limited than those of other important

[47] See U. S. Department of Agriculture, "Soil Conservation, Its Place in National Agricultural Policy," AAA Bulletin G54, May 1936, p. 5.

[48] It should not be assumed that the elements essential for plant growth are limited to nitrogen, calcium, phosphorus, and potassium. Other important elements, including sulphur, magnesium, etc., play an important role in plant growth.

soil minerals; (3) a greater proportion of the phosphorus than of any other mineral element in the soil is lost by erosion; (4) phosphorus must be applied to many eroded and depleted soils in order to grow legumes, which are the best crops for checking further erosion and restoring nitrogen requirements.[49]

Extent of Soil Fertility Losses through Erosion. Erosion results in removing soil from one place and depositing it somewhere else. Obviously, when the top few inches of soil are removed, plant nutrients, including humus or organic material, are likewise removed. Under natural conditions, wind and water erosion is quite slow. Carving out the Grand Canyon and Painted Desert was an age-long geological process. In most instances, geological erosion has been harmless, as far as man is concerned, and has even been beneficial where it has prevented the development of undesirable areas of flat land with clay-pan subsoil, water-soaked plains, and severely leached soils.[50] However, in recent years man has intervened to upset the balance of nature through his methods of utilizing soil. This has greatly accelerated erosion in many areas to the point where normal soil-building processes have not been adequate to compensate for erosion losses that would ordinarily occur in more gradual, normal erosion.

Cultivation exposes soil to wind and rain, and makes the rate of erosion abnormally destructive (see Figure 45) unless man is careful to utilize specific practices tending to offset or largely counteract the effect of exposure and increased vulnerability resulting from the usual type of cultivation. Soil erosion in the United States is generally caused by washing of soil by rain and water, but in certain areas wind velocity is sufficient to remove great amounts of soil.[51] On May 11, 1934, the sun was blotted out over a large portion of the northwestern United States by a huge dust storm that originated in the drought-stricken wheat and sorghum fields west of the Mississippi. This "dry blizzard" swept millions of tons of rich soil off the

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[49] See "Soil Conservation, Its Place in National Agricultural Policy," p. 7.

[50] H. H. Bennett, "Soil Erosion and Its Prevention," in Parkins and Whitaker, *op. cit.*, p. 65.

[51] For a discussion of the numerous types of accelerated erosion, see *ibid.*, pp. 68 ff. Soil conservation experts state that no land anywhere in the United States having a slope of more than 25 per cent can be cultivated safely without protection against erosion, and that all land steeper than 15 per cent is generally doomed to eventual severe impoverishment or destruction without protection. Such land should be maintained in forest, grass, or some similar protective vegetative cover.

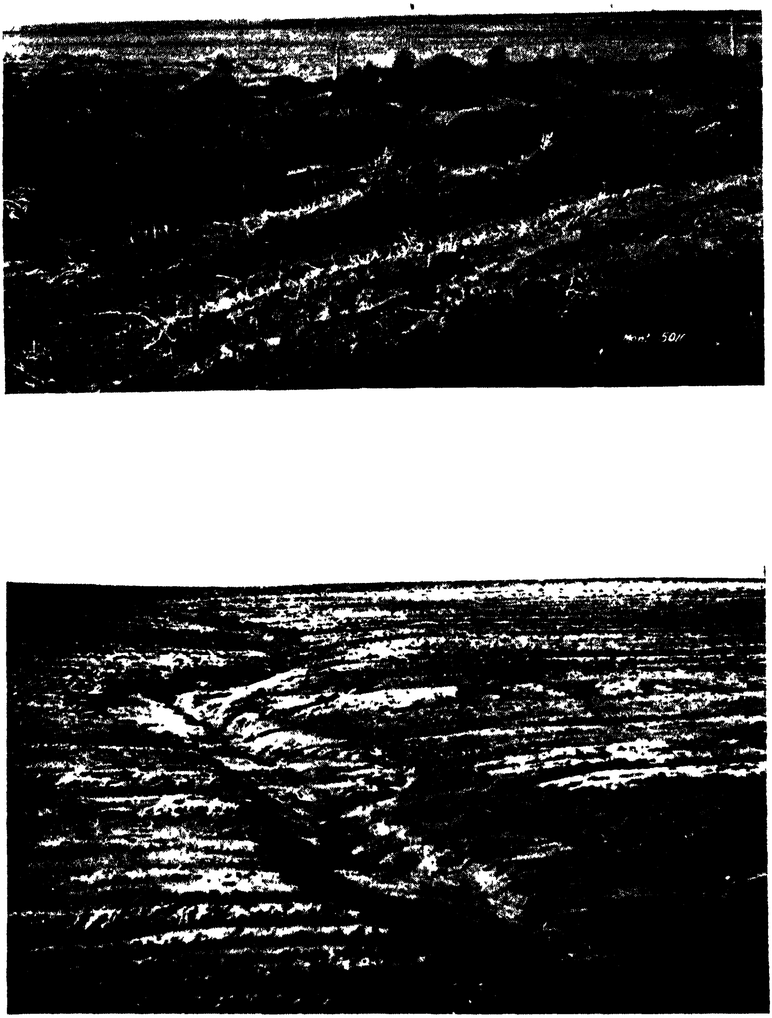

FIGURE 45. Wind and Water Erosion. Serious soil losses are caused by wind and water erosion. The upper picture shows wind erosion in the Northern Plains, and the lower picture shows small gullies and sheet erosion in fallowed land, formed after a single heavy half-hour rain. (Soil Conservation Service photo.)

Great Plains, and called attention to disasters which might follow continuation of existing land use practices.[52]

It has been estimated that at least 3 billion tons of solid material are washed out of American fields and pastures every year, and that some 400 million tons of solid and dissolved matter are discharged into the Gulf of Mexico annually by the Mississippi River alone. This vast quantity of wasted soil is estimated to contain more than 92 million tons of the five principal plant food elements (phosphorus, potassium, nitrogen, calcium, and magnesium), nearly half of this tonnage consisting of phosphorus, potassium, and nitrogen, which are the principal ingredients of commercial fertilizer.[53] Judged by the amount of commercial fertilizer used in the United States annually, erosion removes each year sixty times as much available and potential plant food as the amount returned to the soil in various forms of commercial fertilizer. Although it is difficult to estimate the exact amounts of plant food removed annually through the harvesting of crops, varying estimates indicate that in many cases losses of soil fertility from erosion exceed the entire annual fertility loss from cropping.[54]

When it is recalled that erosion removes not only plant food, but the entire body of soil—plant nutrients, humus, beneficial microscopic organisms—the importance of erosion losses can be seen. It is estimated that in the United States approximately 50 million acres of once productive land have been ruined for further crop use because of soil erosion, and another 50 million acres are in an almost equally serious condition. More than 100 million additional acres (most of which are still in cultivation) have lost all or the greater part of their productive topsoil; and on other acres, erosion is developing rapidly. Good farm land is being virtually destroyed at the rate of more than 300,000 acres annually, with a still larger area undergoing severe impoverishment. The annual monetary cost of erosion in the United States has been conservatively estimated as at least 400 million dollars in terms of productivity loss alone, and the total loss to date as probably 10 billion dollars. Unless erosion is effectively curbed, future costs will probably be equally great. Since unrestrained erosion progresses at an increasing rate, it is of great importance that measures be effected to reduce it.

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[52] Students of soil conservation state that this dust cloud was not merely the result of an unprecedented set of seasonal conditions, but resulted from man-induced soil erosion caused by the cultivation of dry-land areas in the Great Plains region, plus a high degree of ground desiccation and the blowing of a soft, lifting wind. (See *ibid.*, p. 70.)

[53] An analysis of 389 samples of surface soils collected by the Bureau of Chemistry and Soils throughout the United States revealed the following average percentages: potassium, 1.55 per cent; phosphoric acid, 0.15 per cent; nitrogen, 0.10 per cent; lime, 1.56 per cent; magnesia, 0.84 per cent. (See H. H. Bennett and W. R. Chapline, "Soil Erosion, A National Menace," U. S. Department of Agriculture, Circular 33, 1928.

[54] For example, it is estimated that crops, livestock, and livestock products sold off the farm each year in the United States remove 2 million tons of phosphorus they have taken from the soil. (U. S. Department of Agriculture *Yearbook*, 1938, p. 21.) Based on the analysis referred to above made by the Bureau of Chemistry and Soils, the 3 billion tons of soil removed annually by soil erosion would remove 4½ million tons of phosphorus.

Naturally, it is difficult to secure data showing the exact amounts of soil and plant nutrients removed through erosion; but the studies made by Soil Conservation workers have given fairly reliable estimates. In addition to these losses, the following must be added: (1) clogging of great reservoirs and shoaling of stream channels with the sedimentary products of erosion; (2) abandonment of irrigation areas dependent on reservoirs; (3) virtual abandonment of large agricultural areas; (4) economic devastation of considerable western areas dependent upon grazing; and (5) transfer of large farm populations to relief rolls or to the other pursuits.[55]

Desirability of Erosion Control. The length to which nations should go in controlling erosion has been a debatable question. Van Hise concluded that the first principle of soil conservation is not to allow erosion to occur more rapidly than the soil is manufactured. Soils may be renewed, but very slowly, probably not more than 1 inch in 500 to 1000 years. If erosion is allowed to remove soil faster than this, the soil will ultimately be destroyed. Moreover, use of soil should not be allowed to deplete those elements which are limited in amount, and essential for plant food (nitrogen, phosphorus, and potassium—particularly phosphorus).

In spite of this general principle, many contend that in view of population trends and the prospective markets for American agricultural products, there is no sound economic reason for conserving soil, and that although soils may ultimately be destroyed, "ultimately" for some soils would probably be so far in the future as to have no practical significance. However, there are many reasons for controlling erosion quite unrelated to the rate of soil formation from parent material. For example, although the nation may be approaching a stationary population because of a declining birth rate, and the agricultural plant seems too large, outlook for the future is not at all clear. The argument that there is no necessity for conserving soil for the children who will not be born is not an entirely sound one, because we cannot be sure that we will not need much of the land destroyed by erosion during the intervening years. While the export market for agricultural products at the present time is not large, continued industrialization and population increases in certain parts of the world might greatly enlarge the export market for American farm products, provided necessary adjustments in international relations can be worked out. It is true that science and technology may increase agricultural production efficiency and enable our food and clothing requirements to be produced on fewer acres. However, this would not justify allowing 200 million acres of topsoil to wash and blow away. Even if we could be sure that this would not be needed to produce food and clothing for domestic and export purposes, it would help to conserve water and control floods and contribute to a more beautiful countryside and more abundant wildlife.[56] Moreover, much of the erosion that occurs is true waste because it can be eliminated with no reduction in net returns, and frequently with increases. For example, rotations, contouring, or strip cropping often reduce costs or increase net returns.

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[55] Erosion losses data have been taken from Bennett, *op. cit.*, pp. 73, ff. Farmers in the United States spend over 200 million dollars a year for fertilizers which replace only part of the nutrients lost through erosion.

Methods of Controlling Erosion. An effective conservation program necessitates a philosophy of conservation which becomes a part of culture. In developing such a philosophy, education and research are extremely important. Education helps to remedy some of the conditions chiefly accounting for the failure of farmers to conserve their soil. These conditions require specific remedial measures which, however, to be effectively established and maintained, in turn depend upon a thorough educational and research program.

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[56] Cf. "Soil Conservation, Its Place in National Agricultural Policy," pp. 8–9. Soil conservation would tend to reduce the destructiveness of floods, because it is frequently the last 10 per cent of the rise in flood waters that does most damage to life and property. Land management which would save the soil would also increase its absorption power, and thus reduce both rate of runoff and the level at which streams reach flood stage. The usefulness of dams built to check the rate of runoff, both from farms and major stream channels, is impaired by reservoirs filling up with silt. The soil must, therefore, be kept in place if reservoirs are to be most effective. Certainly soil will serve the nation better where it is than by muddying creeks and rivers, or choking channels and costly reservoirs. Studies in Oklahoma reveal that land cultivated continuously in cotton lost 670 times as much soil as that covered with Bermuda sod, and in Missouri it was found that land cultivated in corn-wheat-clover rotations lost 9 times as much soil as that kept in bluegrass. (See M. F. Miller and H. H. Krusekopf, "The Influence of Systems of Cropping and Methods of Culture on Surface Runoff and Soil Erosion," Missouri Agricultural Experiment Station Research Bulletin 177, Columbia, Missouri, 1932, p. 17.)

It has been said that vegetation is the most important single soil-building factor. On land which has not been disturbed by man there is usually a vegetative cover which has developed in harmony with rainfall, temperature, and soil conditions. Consequently, to prevent serious soil losses from washing and blowing when land is brought into use by cultivation and grazing, it is necessary to follow as closely as possible nature's original way of protecting the topsoil. Practically speaking, this means salvaging crop residues for reincorporation into the soil, and using grass and legume rotations according to individually determined adaptability and need. In this way, the soil is recharged with humus to the fullest extent possible during intensified land use.[57] In accordance with this general principle, the method of attack chiefly employed for erosion control and prevention is essentially a coordinated plan of correct land use involving direct methods for reducing effects of erosion by retarding runoff, and also indirect methods such as taking steep, hilly, erosive areas out of cultivation.[58]

An adequate soil conservation program involves a wide variety of engineering, cropping, and tilling practices. The amount and kind of engineering work necessary are determined by the type of erosion and the degree to which it has developed (see Figure 46), character of the soil and subsoil, amount and distribution of rainfall, vegetative cover, and the use to which the land is put. For example, gully control may require dams of earth, rock, or concrete, and grading between dams may be necessary to check the flow of water and permit vegetation to become established. Contour plowing and terracing may be necessary in some areas to put the land in such shape that runoff will be reduced. Retarding runoff increases water absorption, and horizontal furrows plowed across the slope rather than with it are also effective for this purpose in many areas. On range and pasture lands, contour furrows have been quite successful in reducing or preventing soil erosion. Construction of stock reservoirs in coulees and draws on range areas makes available more readily

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[57] Northwest Regional Council, "Soil Conservation: An Outline," Portland Oregon, June 1940, p. 21.

[58] See Bennett, *op. cit.*, p. 95.

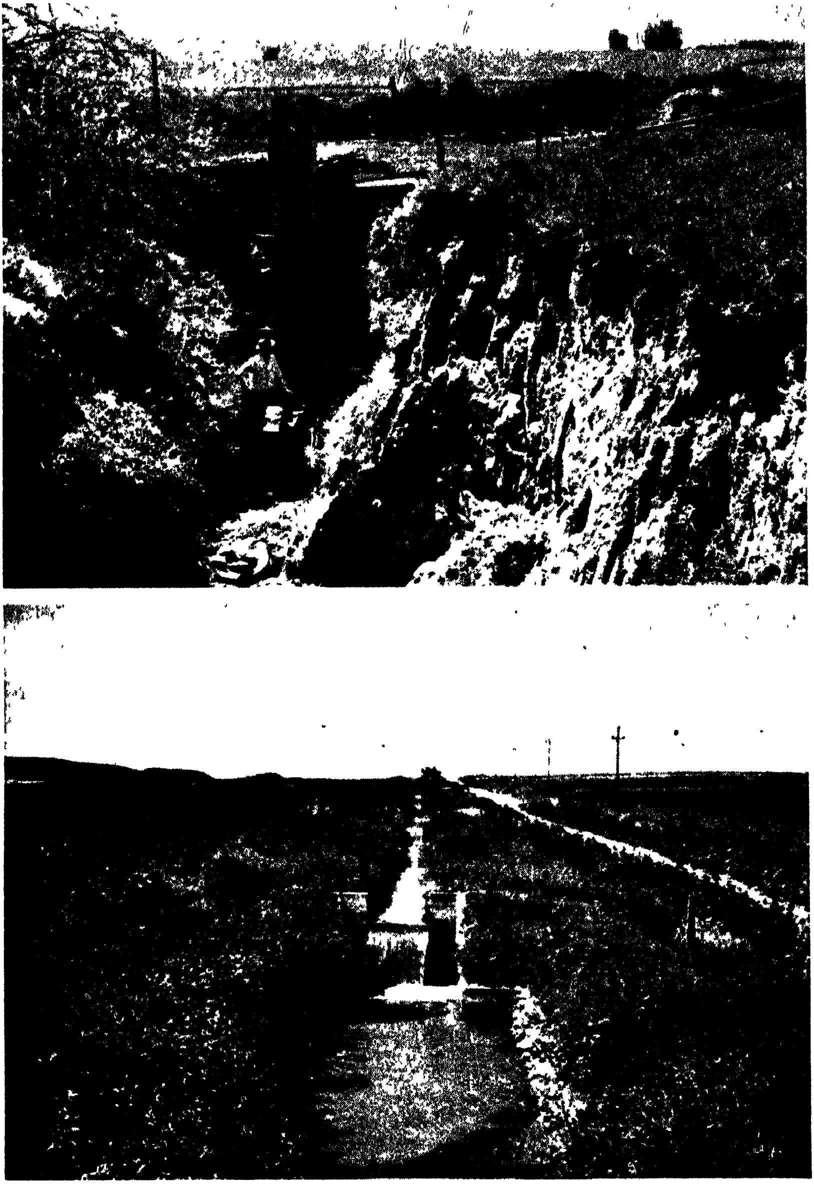

FIGURE 46. Methods of Controlling Irrigation Ditch Erosion. The upper picture shows an inlet drop placed in a badly eroded irrigation ditch. This would be black-sloped and 18" wood checks placed at irregular intervals along the ditch to reduce water velocity. The lower photograph shows a series of masonry drops along the irrigation to prevent excessive erosion. (Soil Conservation Service photo.)

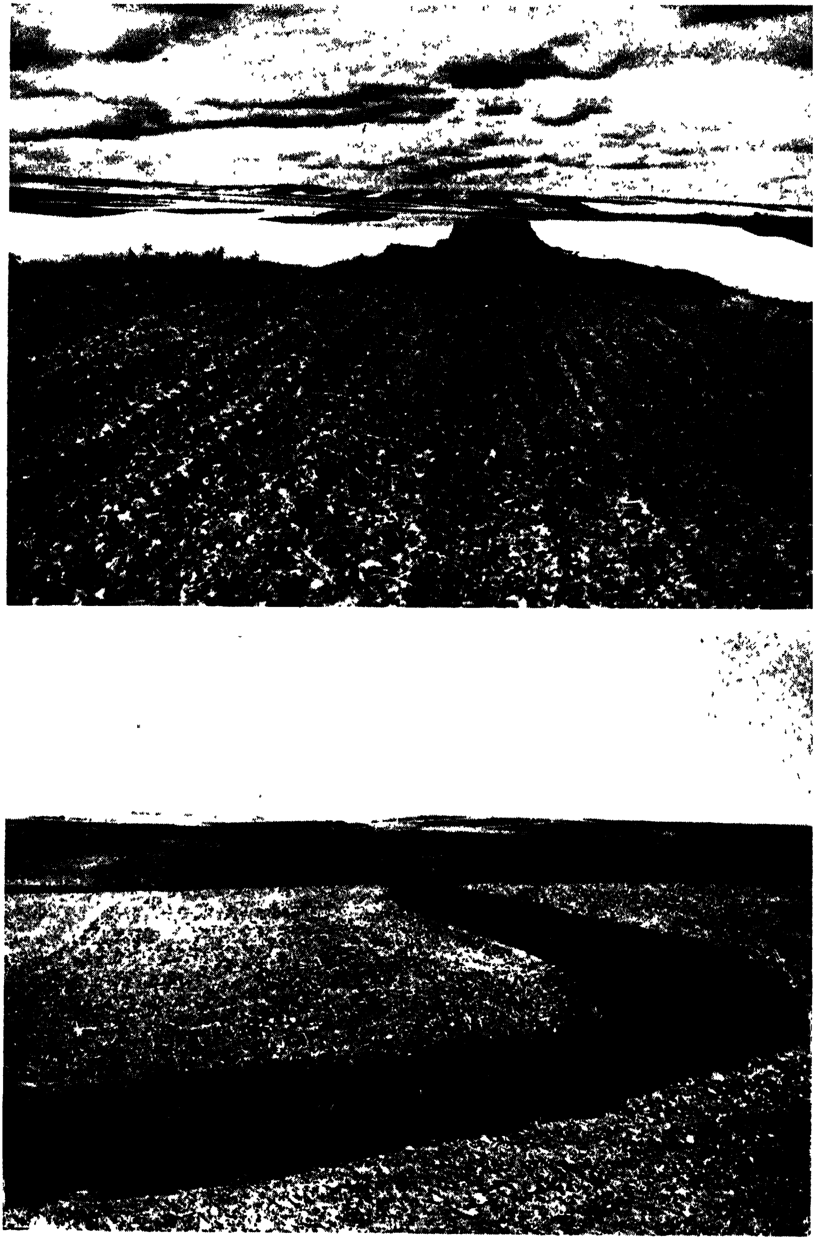

FIGURE 47. Strip Cropping to Prevent Wind Erosion. In the upper picture the strips are alternate fallow and grain. The lower picture shows the late seeding of wheat on the contour with alternate fallow and wind buffer strips. The average width of the strips is 8 rods. (Soil Conservation Service photo.)

accessible stock water, and thus tends to reduce concentration of cattle and consequent overgrazing of certain range lands.

Correct tillage practices are important factors in erosion control because they determine the condition in which land is exposed to forces of wind and water. For example, in semi-arid areas, lands should be left in a rough, cloddy, open condition during winter and spring, so that as much water as possible will sink into the ground, and effects of wind erosion will be reduced to a minimum. In areas of heavier rainfall, serious soil washing may develop if the surface is left clean, free from crop residues, and worked down finely. Subsoil porosity may be increased by deep plowing. Applications of humus in soils deficient in organic material will tend to improve the granular structure of the soil and reduce erosion, and deep tillage will also increase the water absorption power of many soils and reduce erosion. Strip cropping, particularly on steep slopes or areas subject to severe blowing (see Figure 47), appears to be an effective method of erosion control in many areas.[59]

Improved land use practices can do much to maintain soil fertility. In the more humid areas, crop rotations which include intertilled crops, grains, legumes, and grasses will help to maintain soil fertility by providing necessary plant nutrients and controlling the more destructive effects of weeds. Different crops have different food requirements; and certain soils will be seriously depleted in fertility unless crop rotations are used. Agricultural lands, unlike mining lands, can, if properly managed, produce indefinitely; for example, in North China, land farmed for many centuries is still highly productive. The fact that there are many areas in the United States where, after less than 100 years of farming, soils are showing signs of exhaustion, is a reflection upon human intelligence and judgment. Certain soil-conserving and soil-building practices, including use of green manure crops, legumes, and commercial fertilizers, as well as drainage and reclamation, are important factors in maintaining and improving soil productivity.

The student of land economics should realize that no single method can be relied upon to control soil erosion and maintain soil fertility effectively. Methods which will be most effective vary for different regions, communities, types of farming, and types of soil. Moreover, many practices have not been used for sufficiently long periods to establish themselves as the most desirable methods of soil conservation. As knowledge in this field increases, there will undoubtedly be new techniques and more effective methods devised to control or prevent erosion and maintain soil fertility.

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[59] For more details concerning erosion control methods, see Bennett, *op. cit.*, and U. S. Department of Agriculture, *Yearbook*, 1938.

Conditions Unfavorable to Soil Conservation. In spite of the fact that research and experience have revealed that techniques like those indicated are effective in controlling or preventing erosion, and that much work is being done by public and private agencies to acquaint farmers with these methods, many farmers do not practice adequate conservation, because various social and economic forces make it uneconomic or impossible for them to do so. Some of these forces include: (1) inadequate size of farms. Many farms are entirely too small to provide an adequate living for the farm family, whether it is an owner-operator or a tenant family. This causes the operator to concentrate on producing cash crops in order to meet out-of-pocket overhead costs of interest and debt, tax, and related charges. Purchase of modern equipment, and making desirable improvements to check erosion, purchasing fertilizers, or establishing desirable soil-building and soil-conserving rotations, is in many cases financially impossible. (2) Unsatisfactory owner-tenant relations, under which the renter has use of the land with little assurance of permanency or of being compensated for improvements made, and therefore has little incentive to practice conservation.[60] (3) Inadequate and unstable farm income. For a large portion of the agricultural population farm incomes in the United States have averaged low in comparison with incomes of many other groups. This is due in part to unfavorable agricultural prices, and in part to poor crops resulting from unfavorable and fluctuating growing conditions. In many areas, the farmer has exhausted his private and commercial credit and is not in an economic position to finance an adequate conservation program. (4) Heavy farm debt, and (5) heavy farm taxation have often placed financial burdens upon the farm operator which are beyond the land's capacity to carry, with the result that the operator tends to meet these overhead charges by "taking it out of his belt," or "taking it out of the soil," or both. Consequently, soil conservation practices are omitted even though the farmer himself may know that in the long run this is undesirable, since he has no alternative for the immediate future if he is to survive on a self-supporting basis.[61] Some of the changes in farm credit and taxation indicated in the preceding chapters would do much to encourage greater use of soil conservation techniques by farm operators.

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[60] "Of what use is it to educate a tenant or sharecropper, with a one-year lease and an inadequate income, on the physical technique of soil conservation? What is soil 'waste' to the nation is most frequently not waste at all to him. And to what use is it to teach a landlord the same subject if his primary interest in the land is that of a speculator—to sell it as quickly as possible to someone else, and in the meantime to take all he can from the land without reducing the selling price unduly?" (See "Soil Conservation, Its Place in National Agricultural Policy," p. 13.)

The prices of exploitive crops such as cotton, wheat, corn, and tobacco, compared with consuming crops like hay and pasture, are an important factor in establishing farm size patterns and a whole series of institutional rigidities (land values, taxes, schools, markets, etc.) that are difficult to change. The United States has exported large quantities of erosion-inducing crops, especially cotton, wheat, and tobacco, because of the great comparative advantage we possessed in having vast acres of rich land with exceptionally low enterprise costs of production associated with an exploitive system. As fertility declined, costs of production would inevitably have risen and exports of erosive crops would have been reduced, but increased production from newer areas and reduced export demand have created a serious agricultural crisis which may result in greater or less exploitation of soil resources.[62] Which occurs will depend on many factors, not the least of which will be the prices of exploitive crops such as cotton and tobacco relative to the prices of nonexploitive crops such as pasture and hay.

Suggestions to Improve Soil Conservation. Obviously, in view of the economic and social conditions which discourage farmers from adopting adequate soil conservation practices, it becomes necessary to develop techniques which will provide adequate inducements for, or remove existing handicaps to adoption of proper soil conservation methods. It has been estimated that at least two-thirds of all farms are held by people who cannot be expected to do what needs to be done if they are merely informed as to the seriousness of soil losses and techniques for preventing erosion. In addition to a sound educational and research program three separate, though related, types of action are essential: (1) direct subsidies to landowners and operators, (2) stabilization of farm prices and income, and (3) shifts in population and changes in size of farms.[63]

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[61] For these and other conditions which discourage the practice of conservation, see Northwest Regional Council, *op. cit.*, pp. 18 ff.

[62] Bunce, *Economics of Soil Conservation*, pp. 56 ff.

The federal government has subsidized soil conservation through the Agricultural Adjustment Administration, which has made direct payments to farmers for certain soil-building and soil-conserving practices. At the same time, the AAA program has held up prices of erosive crops such as cotton, corn, tobacco, and wheat. Adjusting the economy to stabilize farm prices and incomes on levels which would make possible a more permanently satisfactory agricultural industry, without the necessity of resorting to exploitative practices, would be the most desirable and effective policy to follow. These adjustments will undoubtedly come gradually, and not in all parts of the agricultural industry at the same time or to the same extent. Consequently, such adjustments should be used as a long-time goal of national policy. It is economically unsound to maintain farm prices and income at levels which encourage utilizing submarginal areas and discourage shifting operators on such lands into lines of work possessing greater economic opportunities. In many cases, farms are too small to make satisfactory agriculture possible without subsidies, and national policy should attempt to develop alternative economic opportunities for operators of these lands, enabling their lands to be used by remaining farmers who would have more adequate operating units, or permanently retire distinctly submarginal lands from cultivation. Industrial activity will be an important factor in creating alternative economic opportunities so essential for bringing about necessary shifts in farm population with least difficulty or cost.

The Soil Conservation Service. The United States Soil Conservation Service was established in 1935, as an outgrowth of the Soil Erosion Service established in 1933. In 1939, Soil Conservation Service work was enlarged to include erosion control, submarginal land purchase and development, water facilities development, farm forestry, drainage and irrigation, and the agricultural phases of flood control. Thus, the work of the Soil Conservation Service is centered around the major objectives of developing better land use to promote the general welfare, conserving land resources, and establishing a more permanently satisfactory agriculture.

Specifically, the work of the Soil Conservation Service includes:

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[63] See "Soil Conservation, Its Place in National Agricultural Policy," pp. 19–20.

(1)—*Soil Conservation.* (*a*) Practical demonstrations to illustrate effectiveness of soil-conserving programs by actual work on the land in cooperation with landowners, (*b*) development and improvement of erosion control and soil-conserving measures through research and field tests, and (*c*) dissemination of information among farm people. (2)—*Submarginal Land Purchase.* (*a*) Purchase of land not suited to cultivation, and (*b*) management of these purchased lands under adapted uses. (3)—*Flood Control.* Development of watershed protection measures to reduce flood hazards and reduce damages that result from silting of riverbeds, harbors, reservoirs, and irrigation ditches. (4)—*Water Facilities.* (*a*) Assisting farmers and ranchers to plan development of water supplies for better land use. and (*b*) constructing water and storage facilities. (5)—*Farm Forestry.* (*a*) Production and distribution of nursery stock to farmers, and (*b*) advising farmers concerning the establishment and maintenance of farm forests. (6)—*Drainage and Irrigation.* (*a*) Research in regard to drainage and irrigation techniques, (*b*) development of specialized equipment, and (*c*) provision of diversion dams, pumps, and other facilities to make irrigation possible.[64]

In 1945, the Soil Conservation Service, after a three-year survey covering a total of 1,821,291,000 acres—the first detailed study of agricultural land ever made on such a scale by any nation—reported that almost one billion acres need soil conservation treatment to protect them from erosion and maintain their fertility; 43 million acres, or better than a tenth of the acreage under cultivation, should be retired to grass or trees because they are too steep, eroded, wet, stony, or otherwise unsuited for efficient production of crops; 124 million acres are in need of contour cultivation; 90 million acres are in need of terracing; 96 million are in need of strip cropping; and 212 million acres are in need of crop rotation.[65] Thus, according to these data, a vast soil treatment program is needed. By the end of 1944, more than 65 million acres were producing under the soil conservation system, or nearly double the acreage that had been improved by comprehensive soil conservation work in the eight years preceding our entry into World War II (December 7, 1944).[66]

[64] *Ibid.*, pp. 29–30.

[65] Associated Press Release from Soil Conservation Service, Washington, D. C., August 12, 1945.

[66] *Report of the Chief of the Soil Conservation Service, 1944,* U. S. Department of Agriculture, Government Printing Office, 1945, p. 2.

Soil Conservation Districts. Many believe that a national erosion control policy should aim at securing reasonable control of soil erosion within the next two decades, and at establishing preventive measures within a generation on most of the better lands of the country subject to erosion.[67] In order to carry out an adequate nation-wide program, full cooperation of landowners and society is necessary.

Nearly all of the states, with the encouragement of the federal government through its Soil Conservation Service, have passed state soil conservation district laws.[68] These soil conservation district laws permit farmers to organize soil conservation districts which have the status of governmental subdivisions, and thus combat soil erosion and prevent local misuse of land by cooperative land use regulations.

In order to form a soil conservation district, a petition signed by at least 25 "land occupiers"[69] must be presented to the state soil conservation committee which usually consists of five members. After the petition is presented, the state committee holds a public hearing to discuss the question of establishing such a district and, guided by discussion and evidence presented at the hearing, decides whether the district is needed. The committee defines the boundaries of the district, and gives notice of a referendum to determine public sentiment in regard to the matter. The district boundaries ordinarily include all the territory which should, for physical and economic reasons, be handled as a unit. It is not limited in most states to any given political unit, and may cover parts of several counties, or part of only one.

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[67] The Land Planning Committee of the National Resources Board made the following recommendation in 1934: "A national policy of erosion control should contemplate initiation of erosion control measures on all land now seriously suffering from erosion, within about 10 years, in order to secure reasonable control of erosion within about 20 years, and to establish preventive measures on practically all of the better lands of the country subject to this hazard within a generation." (See National Resources Board; *Report to the President of the United States,* Part II, Section 3, pp. 173–174.)

[68] On June 15, 1944, 1096 soil conservation districts covering nearly 614 million acres, or more than half the area of all farm lands in the United States, had been established in 44 states which had enacted soil conservation district laws. During the year, Missouri enacted soil conservation district legislation, bringing to 45 the number of states in which farmers and ranchers have the benefits of this type of permissive law. (See *Report of the Chief of the Soil Conservation Service,* p. 5.)

[69] By definition, in most state laws, a "land occupier" includes both the owner and the operator, whether a person, firm, or corporation. Some state laws limit petitioning and voting privileges to landowners. Others specify that all land occupiers may petition and vote. (See U. S. Department of Agriculture, "Soil Conservation Districts for Erosion Control," Soil Conservation Service. Miscellaneous Publication 293, 1937, p. 15.)

All land occupiers or landowners may vote in the referendum, according to procedure and conditions laid down by the state law. If a majority vote against creating a district, no district is established; if not, the state committee appoints two supervisors who file an application for certification of organization with the Secretary of State. When the certificate is issued, the district becomes established and an election is held in the district to elect three more supervisors.[70] Each district is an independent unit of government, a subdivision of the state, and not subject to the control of the state soil conservation committee or any other agency, once the district has been created and operations have begun.

Effectiveness of Soil Conservation Districts in Controlling Soil Erosion. The district's board of supervisors formulates a program of erosion control projects and preventive measures and puts it into effect through such technical assistance as it may be able to secure from local, state, and federal agencies, and such equipment as its funds permit and its program requires. Powers granted to a district are of two kinds—(1) authority to engage in cooperative action against soil erosion, and (2) authority to prevent local misuse of land by voting land use regulations upon the district. The supervisors are empowered to carry out soil conservation operations on the land, including contour cultivation, strip cropping, terracing, ridging of pastures, contour furrowing, etc. They may enter into contracts with farmers, give them financial and other assistance, buy lands for retirement from cultivation and for other erosion control purposes, make loans and gifts of machinery, seeds, etc., to farmers and ranchers, take over and operate erosion control projects, and recommend land use plans for soil conservation. If they feel such action is desirable, they may formulate ordinances prescribing land use regulations for soil conservation. These regulations, however, as well as changes in the regulations, cannot go into effect until they have been submitted to farmers of the district and approved by referendum.[71] Soil conservation districts also have power to levy taxes or to issue bonds.[72]

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[70] The administrative affairs of a soil conservation district are directed by a board of 3 to 5 supervisors or directors. Most state laws require 5, 2 of whom are appointed by the State Committee and 3 elected by the farmers of the district. Supervisors or directors must be local residents, and serve for a period of three years. (See *ibid.*, p. 12.)

The use of soil conservation districts to conserve soil resources is an application of the police power. If all the legal requirements are compiled with in establishing a district and securing a favorable vote for operation of certain soil conservation ordinances and land use regulations, "holdouts" who refuse to employ conservation measures called for by the regulations are subject to the same legal procedures as any individual who violates a regularly established statute or ordinance of any other governmental unit. In other words, administrative officers of the district may petition the local court to order the land occupier to observe district ordinances and regulations. The court should, if it issues an order, provide that if an occupier fails to employ the conservation measures required by the regulations the administrative officers may go to his lands, do the necessary work, and collect the costs from the land occupier. In a few states, the court may fine the land occupier for committing a misdemeanor. The laws, however, provide for establishing a board of adjustment in districts which adopt land use regulations. This board is authorized to permit exceptions and variations from land use regulations in cases where application of the strict letter of the law would result in "great practical difficulties or unnecessary hardship."[73]

The decisions of this board of adjustment are subject to review in the local courts. Soil conservation district laws also provide that after a district has existed for a certain number of years (five, in most states), farmers may petition to have the district dissolved. The question of dissolution is then submitted to a referendum, and if a favorable vote is secured for dissolvement, the district is terminated, so that where procedures followed under the law are impracticable, they will not be continued.[74]

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[71] The standard act recommended by the Department of Agriculture requires approval of a majority vote before supervisors can adopt specified land-use regulations. Requiring more than a majority vote, it is felt, places undue influence in the hands of a minority. However, some state laws require the approval of more than a majority before district administrative officers may adopt regulations. (*Ibid.*, p. 11.)

[72] Except in Colorado, where districts are authorized to levy special assessments against the lands. (*Ibid*, p. 14.)

[73] *Ibid*, p. 19.

[74] In the case of *Smoky Hills Soil Erosion District* vs. *Zorn*, a district court in the State of Colorado concluded that it is clearly within the power

Whereas soil conservation districts are a use of the police power, they do not contemplate zoning as this term is usually interpreted. Soil conservation laws comprehend particular, individual soil erosion practices, whereas zoning laws essentially contemplate regulation of land occupancy or broad types of land utilization, by districts. Soil conservation districts cannot control land occupancy except indirectly, through forcing of agricultural operations to cease in extreme cases. However, no technical restriction prevents soil conservation districts from being given zoning powers through broadening their present scope of action by statutory amendment. But, since they have been set up as a specialized means of dealing with a specialized problem—erosion control—it would be inconsistent to broaden these powers on this basis.[75]

Taylor Grazing Districts. In recent years, grazing districts to conserve range lands have been established in many western states under the federal Taylor Grazing District Act and state grass conservation acts. The purpose of the Taylor Grazing Act (passed June 28, 1934) is to stop injury to public grazing lands "by preventing overgrazing and soil deterioration, to provide for orderly use, improvement, and development, to stabilize the livestock industry dependent on the public range, and other purposes." This act authorizes the Secretary of the Interior to create grazing districts from any part of the vacant and unappropriated public domain which is valu-

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of the state legislature to provide for regulation of land use in the interests of erosion control. The Smoky Hills Soil Erosion District of Colorado, on October 14, 1938, adopted the following ordinance: "No additional sod land or land designated by the Agricultural Conservation Program Committee as restoration land shall be broken out or returned to crop production except after consideration and approval of the Board of Supervisors." Upon refusal of the defendants to abide by the ordinance, the district brought an injunction suit to compel the owners to leave the sod land unbroken. The court, in rendering its decision sustaining constitutionality of the act, said, in part: "The court will have no hesitancy in this case in holding that the act is constitutional. It was passed to meet a very great need in this state. It seems to the court that the act is sufficient to meet that need, to control or prevent soil erosion. The legislature has the authority to do as it did in this Act, to grant very broad powers to a district, for a soil erosion district, when formed, is a quasi-municipal corporation and may legislate or make rules on those matters pertaining to the district under a legislative grant of power." (See memorandum from M. G. White, Solicitor to the Secretary of Agriculture, under date of June 17, 1941, released by the Division of State and Local Planning, U. S. Department of Agriculture, August 7, 1941.)

[75] V. W. Johnson and H. Walker, Jr., "Centralization and Coordination of Police Power for Land-Control Measures," *Journal of Land and Public Utility Economics*, February, 1941, p. 21.

able chiefly for grazing, and located in the eleven western states and North and South Dakota.[76] Within districts, grazing is to be regulated under a permit system similar to that in use on national forests. Preference in regard to permits is given those within or near a district who are landowners engaged in the livestock business, bona-fide occupants or owners of water or water rights, and persons acknowledged as enjoying use of the public range at the time the district is established. The lease rates charged and the number of cattle which are allowed to graze in a given district are under control of the Secretary of the Interior. Permits are non-transferable and revocable, and granted for a period of ten years (renewable if the permittee complies with rules and regulations). Before any district is created, local hearings are held where provisions are explained to stockmen, and administration and enforcement of the law are discussed with them.

Under the Taylor Grazing Act, the Secretary of the Interior may accept title to any private or public lands within the boundaries of a district, and in exchange may issue patents of equally valuable public domain land in the same state or within the adjoining state nearest the district. These exchange lands then become part of the district. In most states, only those parts which contain the most consolidated areas of public domain are included in Taylor Grazing Districts, because state, county, or other lands within the boundaries of grazing districts are subject to provisions of the Taylor Act only to the extent that owners of such lands adopt its provisions. In some areas, however, cooperation has been secured from most of the different types of owners, so that Taylor Grazing Districts include considerable land other than public domain land. For the most part, Taylor Grazing Districts are made comparatively large, on the grounds that they will be easier to administer, and less confusion will result in the interpretation of provisions of the act. Land in public ownership is increasing through the federal submarginal land purchase program, reversion of tax-delinquent lands to county and state governments, foreclosures of state farm loans and cancellation of state land sales contracts, and reversion of defaulted irrigation and drainage district lands. Although the Taylor Act applies only to the public domain, its provisions can be applied to land in all types of ownership, provided cooperation of the various types of owners can be secured.[77]

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[76] At the time the Taylor Grazing Act was passed, there were nearly 166 million acres of vacant public lands located in these states.

State Grazing Districts. Many western states have passed legislation providing for establishment of grazing districts, which are non-profit cooperative associations of livestock operators to control and manage use of range lands within their boundaries. The first grazing association established was the Mizpah-Pumpkin Creek Association in Custer County, Montana, which required a special act of Congress in 1928 to permit its organization. As an outgrowth of this experience, the first Montana Grazing Districts Law was enacted in 1933, amended in 1935, and thoroughly revised in the Grass Conservation Act passed in 1939. North and South Dakota and Wyoming have passed similar legislation since 1935. In general, state grazing district laws empower cooperative associations of livestock operators to lease or purchase grazing lands, to develop and manage district-controlled lands, and to allocate grazing privileges among members and non-members. Thus, state grazing district laws are a form of enabling legislation permitting the establishment of collective tenure devices for securing and maintaining control over the right to use range lands.

The state grazing districts fill a somewhat different need from that of Taylor Grazing Districts. State grazing districts seem to thrive most successfully where there is a checkerboard pattern of ownership (numerous small parcels owned by a great variety of absentee and local individual and corporate owners), while Taylor Grazing Districts seem to be most adaptable to areas where federal lands comprise a large proportion of the total area, and the lands are of such low productivity that they have never been alienated from the public domain.

Although the provisions of state grazing district laws vary, two characteristics are common to all—voluntary membership, and restriction of membership to livestock operators. Membership in grazing districts differs, therefore, from that of soil conservation districts where all occupants of the district automatically become members, whether or not they are operators. An analysis of the Montana law will indicate the general procedure followed in establishing state grazing districts. Under the Montana law, a grazing district may be organized when three or more livestock operators controlling *commensurate property*[78] within the area of a proposed state district submit a petition to the State Grass Conservation Commission, composed of five members. A hearing is held by the Commission to determine the desirability of establishing a proposed district, and if this seems feasible and desirable to the majority of those who own or control more than 50 per cent of the lands to be included, the Commission may establish the district. The grazing district is formally organized by filing articles of incorporation with the Secretary of State.

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[77] See Virgil Hurlburt, *Journal of Land and Public Utility Economics,* vol. XI, no. 2, May 1935, pp. 203–206. The admendments to the act passed by Congress in the 1935 session but vetoed by President Roosevelt are discussed by the same author in the November 1935 issue of the *Journal,* vol. XI, no. 4, pp. 410–411.

Grazing districts generally may regulate and control the use of district lands and construct improvements for conservation and better land use; but the Montana law is unique in providing that district control under some cases may be extended to privately owned or leased lands as well.[79]

Weed Control Districts. Another form of cooperative action to conserve land is the creation of weed control or weed seed extermination districts. For example, a law passed in Montana in 1939 provides that when 25 per cent of the freeholders of any proposed district petition the county commissioners for the creation of a weed control and weed seed extermination district, the commissioners shall hold a hearing; and if 51 per cent of the owners of agricultural land in the proposed district file written consent to creation of the district, the commissioners may create the weed district if, after the hearing, they deem it desirable.[80] These districts are administered by a board of three supervisors appointed annually by the county commissioners. After a weed control district has been established, all landowners within the district must comply with rules and regulations established by the supervisors. If such compliance is not met within a time specified by the supervisors, they are authorized to destroy and exterminate weeds found on the land of non-compliers, and costs of such extermination must be borne by the landowner.[81]

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[78] "Commensurate property shall mean any land, which, under proper use, will provide sufficient feed and forage for a given number of animal units during that portion of the year when they are not grazed under permits issued by the district," according to the model grazing agreement used by the Soil Conservation Service. The definition of commensurate property under the Montana Grass Conservation Act includes all three tests—commensurability, dependency, and priority of use. *Dependent commensurate property* is commensurate property which requires, or whose owner furnishes as part of his past customary practices, the feed necessary to maintain livestock during the time other than the established grazing period on the range.

[79] For a more detailed statement of the Montana law, see G. H. Craig and C. W. Loomer, "Collective Tenure on Grazing Lands in Montana," Montana Agricultural Experiment Station, Bozeman, Montana, 1943.

[80] Twenty-five per cent of the freeholders must sign a petition when the proposed district is outside any incorporated town or city of the county, or 25 landowners, when the proposed district is within the incorporated limits of any city or town.

Soil conservation districts, Taylor Grazing Districts, state grazing districts, and weed control and weed seed extermination districts are all uses of the police power. These collective devices have done much in recent years to conserve soil resources and call attention to practices which will increase soil productivity. Each form of control has its particular advantages for special types of agricultural land use, and undoubtedly there will be further developments along these lines as the need arises for special types of collective control and voluntary group action.

Soil Conservation in European Nations. In some areas of the world, soil conservation methods have been used for much longer periods than in the United States, where the movement is quite recent. Soil conservation experiences of many European nations give some idea of the types of land use problems which develop after continued use for long periods, as well as methods or experiences which have proved most effective in conserving soil resources. This experience and the methods developed should be helpful in solving American soil conservation problems, or at least in preventing mistakes which might otherwise be made. Obviously, soil conservation methods most effective in Europe will not necessarily be the ones most effective in this country. In many ways, however, there will be similarity enough so that some American applications can be made.

In the economic development of any area, it is generally agreed that there is first a stage of extensive crops and little need of soil conservation, then a stage of intensive crops and need, but no economic possibility, of soil conservation. Finally, a third stage is reached in which soil conservation inputs become economically possible. Dependence of soil conservation on the stage of intensity reached in land utilization is associated with the scarcity of land in relation to human effort at a given time and place. We have learned that the relative scarcity of land for agriculture is not rigidly set by natural factors like climate, soils, topography, and vegetation, but is influenced by the entire cultural pattern, and by the technical and institutional environment of a given society.

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[81] Under the Montana law, the county commissioners have power to determine the cost of controlling noxious weeds and exterminating noxious weed seeds in weed districts, whether control operations are performed by individual landowners or by weed district supervisors. Where the landowner performs the work involved in the weed control and extermination program, he presents to the commissioners a claim for a third of the cost, which is paid from the noxious weed fund accumulated by county-wide levies. When the work is done by the supervisors, a third of the cost is paid from the noxious weed fund, and the remaining two-thirds is charged against the land on which weed control and extermination work was done.

European agriculture began between 7000 and 2000 B.C., in the Neolithic Age.[82] Its technique did not change greatly until Roman times. Primitive tools confined agriculture to areas which could be cultivated with inefficient tools. Consequently, heavy soils, dense coniferous forest belts, and extremely light soils which, because of quick exhaustion, required continually new clearings, were excluded from use. Such agriculture thrived upon porous loessal soils and alluvial muds around rivers and lakes. These areas were originally covered with oak and beech forests which could easily be destroyed by girdling and fire. The natural scarcity of these areas and their high natural efficiency in production led to an early stability in settlement.

From the beginning, animal husbandry became closely combined with field cultivation in European agriculture, and was the cornerstone of farming systems and the main basis for conserving European soil. With the increase in population under the Pax Romana and under the reign of the Franks, demand for agricultural products increased, and the three-field system of winter grain, summer grain, and fallow became established. Restoration of soil fertility could no longer be accomplished through resting the land a number of years under grass cover, but had to be accomplished through actual use of stable manure and even some soil amendments like lime and ash.

The feudal system and manorial agriculture implanted in all classes of the population an attitude toward the land which would have been brought about much later by economic factors in a free competitive economy. For the upper classes, land became the key and symbol of social distinction and political influence. For the lower classes, assurance of the privilege of cultivating land meant economic security, and land ownership guaranteeing personal and political freedom meant the supreme achievement of life. This psychological pattern lasted until the French Revolution, and is effective in most European nations even today. Land conservation resulted from institutional and technical factors until the end of the eighteenth century, without anything which could be called farm management in the modern sense of the word; but at the end of the eighteenth and the beginning of the nineteenth century, writings on farm management and land conservation began to appear, and the approach was determined by economic analysis, not, as formerly, by agricultural technology, class ideology, or religious and ethical preconceptions. Feudalism and manorialism were rapidly disintegrating, and the economic factors of a free, competitive society became more important than institutions.

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[82] This brief analysis of soil conservation in European nations has been abstracted from Ciriacy-Wantrup, "Soil Conservation in European Farm Management," pp. 86–101.

Breakdown of the old agrarian order caused serious land destruction in various ways. Liberation of serfs produced a numerous class of free but landless agricultural laborers, and a proportional increase in the area which could be operated for profit by the lord himself. This, combined with high prices of farm products, accomplished a rapid commercialization of large estates, and soil deterioration on peasants' holdings also became frequent. High grain prices and serious declines in livestock numbers made maintenance of soil fertility difficult.[83] Land conservation, however, soon came into general use, because it had become economically possible by the time feudal and manorial institutions ceased to be major determining elements in land utilization. Their institutional protection was no longer needed, because land conservation would be adequately undertaken as a result of the operation of economic forces. Optimum intensity had reached a height which included inputs necessary for the sake of conservation.

Land conservation on the Continent became a more important part of farm management policy than in England, because England's rapidly increasing foreign trade made her more and more independent of her domestic agricultural land. Under European climatic conditions, where soil deterioration occurs not because of

[83] Ciriacy-Wantrup points out that livestock was reduced not only by wars but also through "voluntary" liquidation, because the peasantry had to raise large sums to compensate their lords for abolition of personal services and other land encumbrances. It was the same experience China had passed through after the breakdown of its feudal system.

washing or blowing but through depletion of soil fertility, a "doctrine of statics" in regard to fertility conservation became established. This doctrine meant establishment of an equilibrium between decrease of soil fertility through crop harvesting and its increase through application of manure, fertilizer, and other amendments. Emphasis was placed on good rotations which combined exhausting crops with conserving crops. Grains were considered exhausting crops, while conserving crops were those which left a large amount of residue in the soil and enabled production of so much manure that a fertility balance was assured. The goal of good farm management was to increase the proportion of conserving crops in the rotation until the proper balance in the whole farm system was reached. Rising relative livestock prices during the nineteenth century also helped to make sound land conservation programs profitable.

Severe competition of cheap agricultural products from low-cost virgin lands of the United States brought about a European agricultural depression in the seventies, eighties, and nineties, and called attention to the fact that the doctrine of statics did not apply to economic conditions in all parts of the world. This doctrine had developed and thrived under the particular economic conditions of Europe in the first part of the nineteenth century, and applied only to an economy where full conservation of soil fertility was profitable from the entreprenurial standpoint in a laissez-faire economy, or where it was brought about by relative technical or institutional land scarcity and by a conservative mental attitude toward the land, as was the case under feudalism and manorialism. After 1896, the rise of farm prices made it profitable to conserve soil fertility, and also to increase it by applying larger and larger quantities of chemical fertilizers and soil amendments. Manure and the necessary accompanying livestock are looked upon more and more as a desirable part of the agricultural enterprise because of the importance of organic matter in soil conservation.

Applications of European Soil Conservation Experience to the United States. Four major principles of soil conservation may be deduced from European experience: (1) importance of the manure economy for fertility balance of the entire farming system; (2) importance of livestock enterprises and artificial fertilizers and amendments as the most important agents through which fertility balance can be established and maintained; (3) importance of a proper combination of land uses—that is, cultivated land, permanent pastures, permanent meadows, and forests—from the standpoint of feed and manure production; and (4) importance of a proper combination of exhausting or soil-depleting and soil-conserving crops on the cultivated land, from the standpoint of feed and manure production.

These principles obviously apply largely to climates like those of western and central Europe (north of the Pyrenees, the Alps, and the Carpathian Mountains, and west of the Vistula River) where rainfall occurs during all months. The Middle Atlantic states have such a climate. In such climatic zones, the major soil conservation problem is to maintain the proper amount of plant nutrients, including humus, organic matter, and chemical elements. Obviously, these principles are less applicable in semi-arid regions like the Great Plains; but for the major regions of the United States, including the Southeast, the Middle West, and the Pacific Coast, they are quite applicable, particularly when a nation has reached the third stage of economic development. Many are convinced that the United States is entering this third stage of development.[84] Von Ciriacy-Wantrup, however, points out that the mental attitudes of cultivators toward the land are the most important factors in securing adequate soil conservation, and that an attitude favorable to soil conservation was bred into the cultivators of Europe during long centuries of technical and institutional scarcity of land. "To breed this attitude into a new country requires a patience and great educational skill on the part of those who are responsible for a far-sighted conservational policy."[85]

We should not wait to establish the economic feasibility of soil conservation on American farms until the time when land users are forced to conserve the soil, both body and fertility. "The opportunities in a soil conservation program appeal to us as lying not only in the losses to be avoided and the benefits to be gained by the cultivators of the soil, but in large measure in the losses to be avoided

[84] See, for example, the discussion of Ciriacy-Wantrup's paper by W. J. Roth, *Journal of Farm Economics,* February 1938, vol. XX, no. 1, pp. 115–118. Roth states, "I am convinced that we have gone through at least the first two of these stages, and are entering the third. I certainly hope that we have gone far enough to be ready for the third stage, even if we have not actually gone into it."

[85] *Ibid,* p. 101.

and the benefits to be gained by other private and public interests, both agricultural and urban."[86]

CONSERVATION OF LAND RESOURCES IN NON-AGRICULTURAL USE

The conservation movement in the United States developed first in connection with forestry. There are two major reasons for this: (1) Forests were the first of the great natural resources destroyed so rapidly as to attract general attention and arouse alarm; and (2) the movement toward conservation of resources in the United States began largely through men trained in Germany, where conservation theories were developed principally in connection with forestry.[87] It will be recalled that the establishment of a Forestry Bureau in the Department of Agriculture and the later development of the national forests were the earliest practical examples of conservation in the United States.

The Place of Tree Crops in Soil Conservation. Both agriculture and forestry utilize only the top mantle or upper few inches of land; and conservation programs are concerned primarily with these top few inches. However, certain problems in conservation are peculiar to forest lands, and techniques or goals are often different enough from those involved in agricultural conservation to justify a separate analysis of forest land conservation.

Forestry does not, as a rule, involve the tillage required by most agricultural crops. In many areas, the slope of the land or the character of the soil make cultivation impossible without serious erosion losses; and, because of climatic or other factors, grass may not be the best or most profitable use of these lands. In such areas, forestry plays a particularly important role since root growth of trees tends to hold the soil together and prevent severe washing and erosion. Grass is generally more effective than forest vegetation in the prevention of soil-blowing, and where climate and soil factors are such that grass can be successfully grown, trees will ordinarily play a secondary role; but in many areas, where trees represent the best use of land, serious soil conservation problems result unless these areas are devoted to forestry. Moreover, tree crops in some areas will produce greater per-acre yields of forage or usable products than grass. For example, the leguminous Keawe tree of the Hawaiian Islands yields beans valuable for forage on lands where the soil is too dry for any other crop. There are numerous other examples of relatively high productivity in certain areas which may be practically unfit for agricultural use but produce large yields of various tree products.[88]

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[86] *Ibid*, p. 117.

[87] See R. T. Ely, "Conservation and Forestry," *The Foundations of National Prosperity*, Chapter III, pp. 19-24.

The extensive root system of trees makes the water-absorbing ability of forest land much greater than that of agricultural grass land. In areas of torrential rains or heavy rainfall, where there are also great slopes and drainage areas, devotion of considerable acreages to forestry is absolutely essential for control of floods. Conservation of wildlife or development of the highest recreational use of land may depend upon maintenance of effective forest cover. (See Figure 48.) Thus, from the standpoint of conservation in general, forests are in certain areas often much more important than agricultural crops or grasses.

The Need for Forest Conservation. Important causes of forest depletion include damage by fire, destructive logging, inefficient milling and wood utilization, failure to reforest or replant cut-over areas, failure to practice sustained-yield forestry, damage from tree diseases and insect pests, taxation policies which levy burdens on the basis of "wreckage value" and force exploitative forest use practices, and a tenure pattern of private forest land ownership often resulting in severe competition and exploitative practices. The more important consequences of forest depletion include (1) increased future prices of forest products, because of decreased supplies and reduced quality of products in relation to demand; (2) decline of a great industry engaged in exploiting and manufacturing forest products; (3) injury to transportation systems in cutting down volume of freight carried by railroads and other transportation units; (4) injurious effects upon water resources and disastrous results from soil erosion; (5) injurious effect on local communities because of depopulation and general impoverishment of extensive areas; (6) destruction of or injury to scenic features possessing significant recreation values; (7) destruction of the habitat of many species of wildlife (particularly fur-bearers and upland game), including game birds and many big game animals; and (8) reduction of the range carrying capacity or forage production in many forest areas in the western states.[89]

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[88] It is said that, on an acre of good Keawe trees, six cattle will average gains of more than 2 pounds a day on raw beans which they pick up for themsleves; and that from the middle of July the six cattle will gain 1200 to 1600 pounds per acre on land with rainfall of 20 inches a year. In comparison, an acre of good Kentucky bluegrass pasture or rich English pasture will produce 150 pounds of mutton per year, while corn and alfalfa will make about 450 pounds of beef and pork per year in Illinois. The carob bean, an article of food for at least 2000 years in many Mediterranean countries, grows on rocky hillsides, lives for generations, and is produced in areas too dry for corn. However, it has sold at the same price as Indian corn and yields the same or greater amounts per acre. For a statement concerning productivity of the carob bean tree, the honey locust, the chestnut, and others, see J. Russell Smith, "Tree Crops," in Parkins and Whitaker, *op. cit.*, pp. 104–114.

An adequate forest land conservation program should include: (1) development of effective protection from fire; (2) observance of such minimum logging requirements as disposal of slash and leaving of seed trees to secure conservational logging practices; (3) more efficient milling and wood utilization through use of wood waste, wood preservatives, and some wood substitutes; (4) forest planting and management to secure renewal at a rate commensurate with needs for various forest services ranging from wood supply to game cover; (5) restocking of burned-over or cut-over forest lands unsuited to agriculture, particularly in watershed areas; (6) planting trees for windbreaks in some exposed areas; (7) application of sustained-yield principles to as many forest areas as possible; (8) tax revision to adjust tax burdens more closely to the peculiar nature of forest returns and encourage sustained-yield management and conservational logging practices; and (9) increased public purchase of forest lands to make possible more orderly utilization of resources, to relieve the competitive situation in some areas, and enforce conservational logging on the public forest lands through leasing regulations. As in the case of agricultural lands, public ownership does not of itself guarantee conservational logging, but the United States Forest Service has demonstrated over a period of years that it is possible to utilize conservational logging and other improved land use practices in the management of national forests.[90]

Costs of Forest Conservation. One important difference between agricultural and forest land utilization is the longer periods required for growth of tree crops. We have noted the significance

[89] The first six of these eight economic consequences are cited in Van Hise and Havemeyer, *op. cit.*, pp. 271–272.

[90] For a more detailed statement of measures for adequate forest conservation, see J. R. Whitaker, "Essential Measures in Forest Conservation," in Parkins and Whitaker, *op. cit.*, *chap.* XI, pp. 262–286.

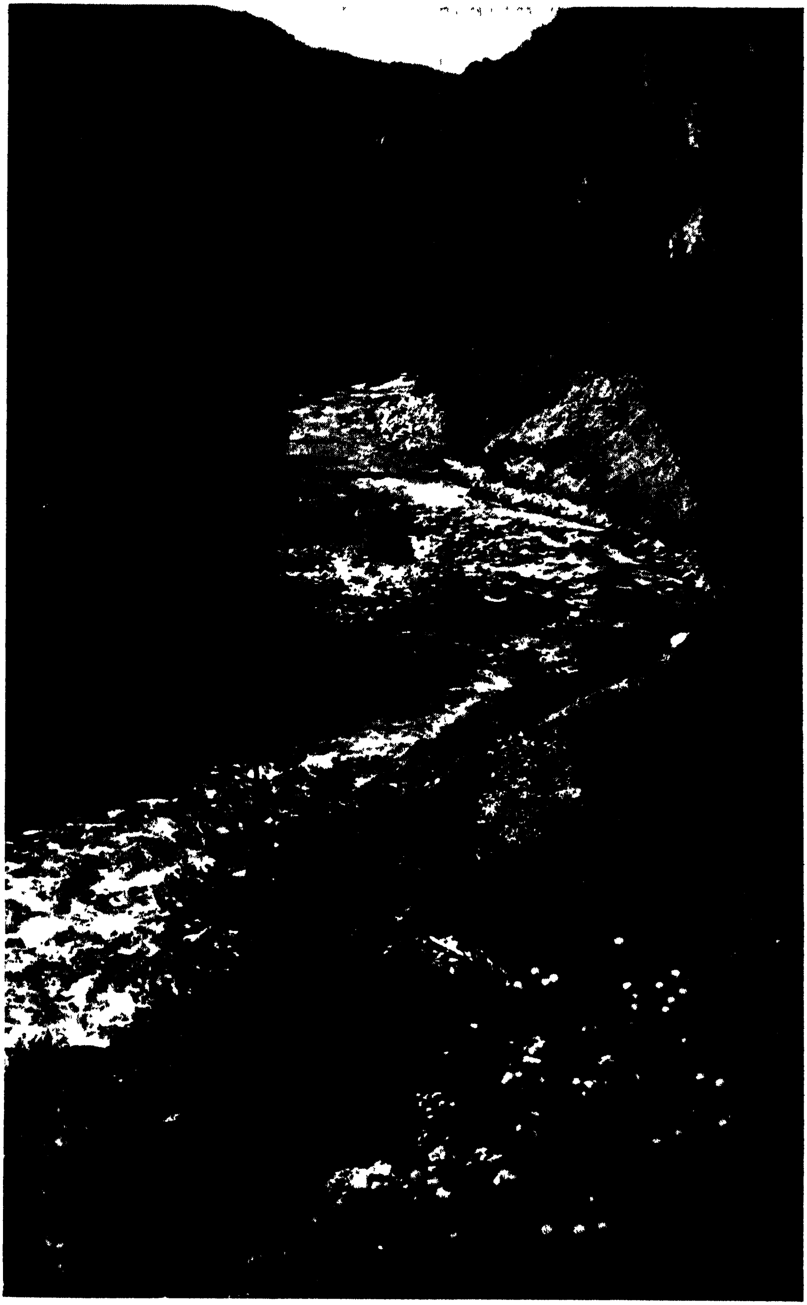

FIGURE 48. Forest Areas. Well-maintained forest areas have great economic and recreational value. (Montana State College photo.)

of time-preference and the rate of interest in conservation. Conservation costs are obviously increased where the period of time involved in a given conservation program is long, because future values are discounted to the present. Although slash pine for pulp in the south can be grown in a relatively few years (5 to 15), many species of trees require such a long period to mature that the average individual is ordinarily not interested in reforestation or planting programs essential for forest conservation.

In the case of many agricultural lands, economic rewards for conservation practices can be secured within a year, and in some cases less. In the case of forestry, however, many years may elapse before tree crops are ready to be harvested, so that economic rewards are not nearly so prompt. Moreover, returns per acre in forestry are likely to be considerably smaller. since forestry is usually a less intensive use than agriculture; and the uncertainties of a long waiting period help to make conservation programs that may be economic from an individual standpoint unattractive to private initiative. Forest land conservation will ordinarily require programs in which public initiative in the form of subsidies, management, or ownership takes a much more active part than in agricultural land conservation.

A Program for Recreational Land Conservation. Recreational use is characterized by certain peculiar problems and conditions which make sound conservation measures for such lands different from those designed to conserve other lands. In the first place, the recreational use of many areas is associated with other uses, some of which return owners economic rewards quite apart from recreational values of such lands. In many cases, the qualities or characteristics which give land value for recreational purposes are comparatively intangible, and this, coupled with the fact that recreational enjoyment does not involve pecuniary reward, makes private initiative unable to provide an adequate conservation program in the case of most recreational lands. An excellent example of this is the conservation of wildlife (an important part of recreational land conservation) which is undertaken almost entirely through public programs.

The demand for recreational land rises with increased leisure, improved transportation, and high living standards characteristic of modern society, but there are serious problems associated with securing and maintaining lands for recreational use in competition with other uses. Only those lands will be developed by private enterprise on which alternative uses are less valuable or satisfactory. The amount of such land is far short of that required to meet current and prospective recreational requirements, so that public development is essential. Public agencies, however, may select for recreational use lands which have alternative uses of great economic importance, and may eliminate competing uses by zoning or other regulatory measures, thus assuring the use of the land for recreation, or they may attempt to share use of the land with other uses on some control basis. In many areas, conservation is largely a problem of determining the relative importance of different uses for a given piece of land or area.

Much expense is frequently incurred in recreational land conservation to remove economic scars lowering the recreational value of land, or to construct facilities necessary to make recreation areas available. Many developments to improve recreational land resources cannot be financed by charges, commissions, admission rates, and so forth. Thus, the government must act as initiator or manager and undertake the conservation program directly.

A large group of recreational land use problems chiefly concerning scenic aspects of the landscape result from commercial development of private lands contiguous to or near recreational areas. Their solution involves the whole range of regulatory and control measures, including zoning, scenic easements, mortgage clauses, recreational districts, conservation districts, and related methods.

Problems of Mineral Land Conservation. The increasing importance of minerals, combined with the fact that mineral resources are exhaustible and—unlike agricultural or forest products—not replaceable, makes conservation of mineral resources peculiarly vital to the general welfare. Where a resource cannot be replaced or grown, the necessity of deciding from day to day how much should be used currently and how much should be saved for posterity is vitally important. Mistakes can be partially or wholly corrected in the case of resources which can be grown or replaced; but current mistakes or wasteful exploitative practices in the use of exhaustible and irreplaceable resources like minerals may cause irreparable damage to future generations.

One of the most important factors tending to discourage mineral conservation and encourage wasteful exploitation is the uncertainty of discovering new deposits, and the uncertain amount of mineral reserves. The "chance factor" in discovery has discouraged consistent planning for efficient utilization, because discoveries of deposits have, at least thus far in the United States, provided adequate supplies of most important minerals in spite of wasteful exploitation. Depending upon chance discovery can be a disastrous policy, and the United States should develop a more systematic conservation plan for mining, and utilizing its mineral resources. In addition to the uncertainties of discoveries and of reserves, three other conditions distinguish mineral conservation problems from those of other land resources: localized occurrence, tendency to increasing cost and, to a lesser extent, accumulation of metal stocks.

A Conservation Program for Mineral Resources. Specific conservation measures must be developed for each of the major minerals. There are three bases for distinguishing or classifying mineral resources in relation to the effect of exploitation upon them. These are: (1) *availability* of resources, (2) *substitutability* of resources, especially of flow for fund, and (3) *recoverability* of resources. Regarding *availability*, reserves of minerals are so varied that some exist in inexhaustible amounts while reserves of others are apparently critically low. Concerning *substitutability*, vegetable oils and alcohols, for example, may be used for fuel and lubrication, thus substituting flow for fund resources. In regard to *recoverability*, there is great variation in durability of mineral products and the recoverability of usable waste products after these products are worn out. For example, coal and oil have no durability or recoverability, whereas iron has great recoverability.[91] In general, however, the chief conservation problem for mineral lands is prevention of resource waste and the associated social and economic disorders caused by destructive competition so characteristic of those minerals in which there is a surplus of plant capacity or production facilities. In this sense, the conservation problem is more one of economics than of technology, and the task is to help these mining industries prevent competitive waste, stabilize employment, limit or at least control cutthroat competition, and through increased stability permit those savings in the resource which technology has already made possible. Means of controlling production, capacity, stocks, and, in some cases, prices must be considered. Such control by private industry has been forbidden under the antitrust laws; but it may be wise to permit and even encourage such control, under public supervision, in those industries involving natural resource waste. It is high time we recognized that in some minerals competition leads to excessive waste which we cannot afford.[92]

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[91] For a careful analysis of resource classification for conservation policy see C. H. Hammar, "Society and Conservation," *Journal of Farm Economics*, vol. XXIV, no. 1, February 1942, pp. 110-115.

The ill effects of destructive competition include more than the waste of irreplaceable natural resources. Such destructive waste also endangers living standards of mine workers, whose isolation, relative immobility, and hazardous life merit special consideration which may justify provisions for eliminating or at least reducing these ill effects to a minimum through public or private action. Public policies perhaps sufficient to do this would be Congressional legislation authorizing systems for control (by operators within the industry proper) of mining output, mine capacity, or both, and in some cases authorization of minimum and maximum prices. Specific amendment of the antitrust laws may be necessary to permit such action in certain fields—particularly in the case of coal, oil, gas, and the non-ferrous metals. In some cases public monopolies might be necessary, or the price of the product might be left low and the product rationed by society; which is preferable depends upon the resource.

In some mining industries, such as that of iron ore, industries acting alone have been able to prevent dissipation of resources and economic and social distress. But, certain significant dangers associated with concentrated ownership would seem to justify public regulation of prices and labor practices. In other mining fields, however, particularly coal, oil, copper, lead, and zinc, experience has shown that industries acting alone have not been able to prevent the dissipation of mineral resources or the occurrence of widespread economic and social distress. Although each has its own distinctive problem, all these industries present to some degree the common problem of controlling destructive competition.[93] Experience has shown that a reasonable profit tends to stimulate conservation, because the more valuable an object becomes, the more men tend to save it, and the less valuable, the more carelessly it is used.

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[92] This problem and some alternative methods of dealing with it are developed in more detail in *National Resources Board Report*, pp. 400 ff.

[93] *Ibid.*, pp. 400 ff.

If mineral reserves are not to be exploited and wasted needlessly, it is necessary to develop a program whereby reasonable prices can be secured and the industry stabilized so that waste accompanying low prices, overproduction, and related conditions may be reduced to a minimum.

Manufacturing transforms products from their original character into a multitude of new products, using many otherwise waste products in the process. Because minerals are so important—and increasingly important—in manufacturing, and because so many minerals are of durable character, one function of manufacturing is that of conservator of mineral resources.[94] In many cases, the mining and manufacturing of certain minerals used in industry do not constitute a destructive process, in the true meaning of the word, but rather a change in form[95]—frequently to forms more available for alternative uses.

Conservation of Water Resources. Water is regarded by many as a resource so necessary to the general welfare in its various uses that it should be publicly owned, with private beneficial use.[96] It has been suggested that water rights should be allocated so that under suitable social regulation the water will naturally accomplish the largest results.[97]

The problem of conserving water resources is mainly one of controlling rights to use water so that beneficial use can be distributed to the greatest possible number of people for the longest time. Water for drinking purposes is necessary for human life; water for irrigation in certain semi-arid and arid regions is essential for successful agriculture; power generated through hydroelectric construction is important in industry and manufacturing; use of water for transportation (particularly ocean transportation) is essential for the free movement of international trade and the maintenance of modern levels of living; and around large cites, an adequate water supply is necessary for waste disposal and maintenance of health. Thus, practically every use of water is important to such a degree that restricted control or appropriation by selfish private interests might cause widespread suffering and social loss. The type of conservation program which will most effectively apportion the rights to use this resource will vary in different areas and for different uses.[98]

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[94] Helen M. Strong, "Conservation of Natural Resources and the Manufacturing Industry," in Parkins and Whitaker, *op. cit.*, p. 483.

[95] An excellent example of this is the collection of old aluminum pots and pans assembled by local communities in 1941, in connection with the effort to increase aluminum supply for defense needs.

[96] See, for example, Van Hise and Havemeyer, *op. cit.*, particularly pp. 152–161; R. T. Ely, "Conservation Policies," in *Foundations of National Prosperity*, p. 62; and Frank Williams, "Water Power and Its Conservation," in Parkins and Whitaker, *op. cit.*, p. 332.

[97] Professor T. N. Carver suggested the system of selling water rights by auction, with the idea that he who will pay the most will make the best use of the water. Ely points out that shore lands ought to be, in general, publicly owned, and that although there are occasions when exclusive private beneficial use should be allowed, ultimate ownership should nevertheless be public. The experience of cities like New York and Baltimore confirms this position, and failure to recognize earlier the wisdom of such a policy has produced enormous costs and great wastes. (See Ely *et al.*, *op. cit.*, p. 62.)

Conservation of Transportation Land Resources. The major problem is unification of the transportation system of the nation so that the most efficient transportation services can be established and maintained. Best use of land for transportation necessitates such unification, and the best conservation program will, therefore, be that which most effectively improves the general transportation system.

A committee appointed by the President of the United States made the following recommendations, among others, as an improvement program: (1) Adoption by the federal government of a definite national transportation policy providing for fair, impartial regulation of all kinds of transportation, administered to preserve the basic advantages of each. (2) Placing responsibility to administer all regulatory provisions with respect to rates, services, valuation, etc., for all type of transportation in the Interstate Commerce Commission. (3) Substitution of a new rate-making rule applicable to all types of transportation for the present provisions of section 15*a* of the Interstate Commerce Commission Act.[99] (4) Repeal of the "long and short haul clause" of section 4 of the act. (Under this clause, railroads are prohibited from charging rates to or from a given point lower than those applying directly to or from intermediate points, without authority of the Interstate Commerce Commission.) The committee feels that this rule has proved a serious handicap to railroads competing with other types of transportation. (5) Establishment of a new and independent agency, to be known as the Transportation Board, charged with the duty of investigating and reporting to Congress concerning relative economy and fitness of the several types of transportation and the extent to which these are now subsidized, together with recommendations for further legislation. The committee also recommended that the Transportation Board be charged with responsibility for administering, in behalf of all types of transportation, the regulatory statutes relating to new construction or operations and abandonment of facilities or operations. (6) Establishment of a fair and reasonable system of tolls for the commercial use of certain inland waters and elimination of the Inland Waterways Corporation and disposal of its properties. (7) National and state legislation to relieve railroads of certain tax burdens and to provide that the government bear the expense of eliminating grade crossings. (8) Reimbursement of railroads by the government for all costs in excess of any direct benefit accruing to them incurred in changing or reconstructing bridges or other facilities in connection with improvement of navigable waters, flood control, or similar projects.[100]

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[98] According to the Energy Resources Committee of the National Resources Committee, the Boulder Dam Project, the TVA, and the Hudson River Regulating District "demonstrate the practical ability of operating multiple-purpose reservoir systems so as to yield substantial benefits of many types, including hydroelectric power. A major objective in conservation of the nation's power and water resources is to insure that such combined developments will be designed and operated to produce maximum benefits wherever the physical and economic conditions render them feasible." (See National Resources Committee: "Energy Resources and National Policy," p. 313.)

[99] The committee recommended that it should be the duty of the Commission to exercise its authority over rates so far as is consistent with its duty to protect the public against the exaction of unreasonable and unjustly discriminatory rates. This proposal would not limit the power of the nation to prescribe maximum and minimum rates, or to suspend new rates. The present

Urban Land Conservation. The principal problem in conserving urban land is to secure utmost economy in movement and economic activity of large numbers of people concentrated in relatively small areas. Experience favors a large amount of public ownership or effective public regulation of urban land uses. The specific objectives of urban land conservation are chiefly to control private utilization through: (1) Segregating land uses to prevent develop-

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so-called rate-making rule embodied in section 15*a* has, according to the committee, proved unsatisfactory in practice, due largely to the construction placed by the Commission on the direction contained therein that in fixing rates it should give consideration, among other things "to the effect of rates on the movement of traffic."

[100] These constitute the more important recommendations of the committee. For more details see Report of Committee Appointed September 20, 1938, by the President of the United States, to Submit Recommendations Upon the General Transportation Situation, Washington, D. C., December 23, 1938.

ment of "blighted" or slum areas and resulting depreciation of land values and loss of utility or buildings. (2) Proportioning land going into various uses so as to prevent too much going into commercial or industrial uses and too little into residential use, or vice versa. If this is effectively done, occurrence of many vacant and abandoned lots will be prevented. (3) Reducing congestion and the consequent economic and social wastes. Introducing desirable public control or regulation of land utilization through zoning, neighborhood unit planning, building, sanitation, plumbing, electrical and other codes, revising tax policies to aid rational urban land use, and in some cases increased public landownership, if other methods have failed or proved to be ineffective. (4) Lowering costs of expanding the city area through subdivision control.[101]

The quality of land (location, or situs) which gives it its value for urban use is physically indestructible, and many conclude from this that there is, therefore, no conservation problem in urban lands. However, the economic value of situs, or physical location, can be readily destroyed by unwise urban land utilization practices. This is illustrated by the destruction of property values in blighted and slum areas. Urban land is so dependent upon its improvements—dwellings, streets, commercial structures, and factories—that the problems of maintaining the value of improvements are problems of urban land conservation. Consequently, conservation must be built around the central idea of controlling city land use to prevent the development of blighted or unsatisfactory areas and socio-economic wastes and distress. In most instances, using one or more of the various social control devices such as the police power, zoning, eminent domain, or taxation will adequately insure land utilization practices which will conserve urban land values and benefits. Some acquisition of lands by the government, however, may be necessary to adjust present land use practices to those necessary to conserve such values and benefits. In general the cities of the next generation will differ from today's in proportion to the strength of the dynamic forces of city change, especially those comprising the social climate and social objectives.[102]

[101] See Dorau and Hinman, *Urban Land Economics*, pp. 251–258.

[102] For interesting suggestions of possible future trends in city design by leading architects and engineers see M. D. Meyerson and R. B. Mitchell, "Changing City Patterns," *Annals of the American Academy of Political and Social Science*, vol. CCXLII, November 1945, pp. 149–162.

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PART FIVE

PLANNING AND CONTROL OF LAND USE

CHAPTER EIGHTEEN

PLANNING THE USE OF LAND

THE exploitation and waste of natural resources (particularly mineral forest, and certain agricultural lands) that has occurred through private appropriation in the United States reflects the trend of rapid resource development accompanying advancing technology and commercialized production typical of the times. Private property lent itself to such exploitation because it gave much freedom to the large number of individuals with property rights in land resources. The rapid rate of development and utilization has permitted a higher material level of living for the present generation than a system of public ownership would have allowed. Under public ownership, land would have been withheld from use, or the rate of development and use would have been restricted to immediate needs rather than determined by prospective, often speculative, demands developed by profit-seeking private interests; nevertheless, most Americans would probably agree that in spite of mistakes made in utilizing land resources through private ownership, its advantages have more than offset its disadvantages except possibly in timber and minerals. Consequently, the best program to follow is to restrict or control private practices instead of removing land resources completely from private hands. In other words, continuance of private property in land is generally approved with the understanding that the dwindling of many basic land resources and the complexities of modern life necessitate an increasing degree of social control and regulation to prevent excessive abuses or wastes.

It is generally conceded that some systematic plan or policy guiding resource utilization in the interests of the general welfare could have prevented many of the social wastes and losses of unrestricted exploitation. Far-reaching recent economic and social changes have shaken the very foundations of civilization and have centered attention upon planning use of land resources to prevent the dangerous consequences of unplanned exploitation.[1] The harnessing of nuclear energy in the form of the atomic bomb during the latter part of World War II presages great technological changes ahead, with corresponding far-reaching impacts upon the economy and the social and the institutional structure.

THE PLANNING PROCESS

The practical justification for the study of land economics is a belief in the possibility of improving the quality of human living through changing the organization of want-satisfying activity in land resource utilization. Most attempts to improve human living involve substituting for private property and individual freedom of contract a more consciously social form of control; and such attempts will have more chance to produce significant improvements if the character and tendencies of the system to be modified or controlled in the interests of general welfare are clearly understood. Chapter IV pointed out the nature and attributes of private property, the evolution of landed property to its status in modern society, and the peculiar economic and social advantages or disadvantages which accrue to those who secure property rights in land. This analysis and the discussion of land use problems in Part IV reveal the desirability of certain adjustments and improvements in land resource utilization to increase the general welfare and indicate that such changes would probably not be effected promptly or adequately by the usual individual private efforts operating through the institution of property and individual freedom of contract.

The degree of social unity necessary to achieve the highest possible level of living can best be brought about by organizing the economy so as to make the fullest use of productive capacity, and prudently conserve, develop, and utilize its material and human resources. This necessitates a plan to guide all segments of the economy toward the desired goal. The first problem, therefore, is to formulate a policy and plans; the second, to effect them by means of those instruments of social control best adapted to the situation.

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[1] According to Galloway, we are living at the end of an epoch, and "if the nineteenth century was the Age of Planlessness, the twentieth century is certainly the Plan Age." (George B. Galloway, *et al.*, *Planning for America*, Holt, 1941, pp. 3–4.) See also Lewis L. Lorwin, *Time for Planning*, Harper, 1945, chap. I.

The Nature of Planning. The word "planning" is used in many ways, and means different things to different people. Generally speaking, however, planning is a conscious effort to direct human energy to secure a rationally desirable end. Every plan has two major elements—a goal and a method.[2] Planning is the opposite of improvising. In simple terms, it is organized foresight plus corrective hindsight.[3]

The concept of planning is nothing new. Each individual businessman—farmer, banker, industrialist, or whatever he may be—plans operations on the basis of future expectations and past experience. As long as men are confronted with problems, a certain amount of planning will be done; but planning in the past has not been complete or coordinated enough to bring about balance and unity within the whole economy. In a well-planned economy, responsibility for production organization is centralized; but individual planning is decentralized, the spontaneous decisions of private citizens being assumed to serve in the aggregate the general welfare. But as one writer has put it, "The evident failure of individual planning in recent years to promote the public good is leading the visible hand of the State to replace the 'invisible' hand of Adam Smith."[4]

Social vs. Individual Planning. The history of the United States affords examples of special-interest or pressure-group planning for labor, agriculture, or industry, but none of over-all social planning in the interests of the whole nation. Individual or group-interest plans have often advanced selfish interests, to the detriment of the general welfare. Furthermore, when the automatic self-regulating mechanism of the market place fails in its traditional function of harmonizing and synchronizing the various individual plans of men, a social plan or over-all blueprint is necessary as a coordinating or synchronizing agent. The question is not a matter of *whether* to plan, but of *how* to plan.

Social planning may be distinguished from individual planning, and plans designed to protect or promote group or sectional interests, by six essential characteristics:[5] (1) Social planning is concerned with dynamic things and deals with change and variability. (2) It is continuous and flexible rather than occasional and intermittent. (3) It is a function of collective activity, achieving a collective objective or solving collective problems. (4) It relies upon research and experiment, rather than guesswork. (5) It is concerned with coordinating specialized activities. (6) It is a specialized service function requiring the temperament and analytical powers for fact-finding, logical synthesis, and perfection of arrangements to achieve its objective.

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[2] Lorwin, *op. cit.*, p. 5.

[3] Galloway, *op. cit.*, p. 5.

[4] *Ibid.*, p. 6.

[5] Harlow S. Person (ed.), *Scientific Management and American Industry*, Harper, 1929.

Planning, conceived of as a process, can be said to embrace the following steps:[6] (1) determination of the objectives sought; (2) research leading to an understanding of the problem; (3) discovery of alternate solutions; (4) choice of alternatives (including the frequent choice of doing nothing), or what may be termed "policy-making"; (5) detailed execution of a chosen alternative which may be referred to as the "blueprint" or "design."

Many people feel that planning tends toward regimentation, with rigid rules compelling individuals to conform; but they forget that compulsion exists whether operations are planned or unplanned, because chance compels conformity in line with certain events even if there is no planning. It has been argued that, on the whole, planning probably reduces regimentation by eliminating some of the uncertainty and inhibiting force of chance in a situation.[7]

Goals of Planning. A planned economy without definite social goals is a contradiction in terms, for "it must lead to a series of concrete destinations, expressed economically as a standard of living, and morally and socially as a way of life.[8] Planning is nothing more, in the last analysis, than collectivism applied to the major processes of the economic system, may be used by any society, and may be partial or complete, restrictive or expansive, democratic or

[6] Galloway, *op. cit.*, p. 6.

[7] Cf. *ibid.*, p. 7. This same thought is expressed by many other students of social planning.

[8] Lewis Mumford, "Forward" in Findlay MacKenzie (ed.), *Planned Society Yesterday, Today, and Tomorrow*, Prentice-Hall, 1937, p. ix. Mumford points out that, without definite social goals, industrial production will expand in one direction if the social aim is exploitation and conquest of other people, and in other directions if the aim is new housing and new communities for the population as a whole. Even competitive industry attempts to fix standards, in terms of goods, which will produce the maximum opportunity for profit.

authoritarian, militaristic or pacifist, and so on, depending entirely upon the aims of the society.[9]

The goals of planning, then, vary with the type of planning and the agency undertaking it. In general, the aim of planning in a democratic nation is to promote a progressive rise in material and cultural levels of living for all the people, through reasonably full use of the nation's productive resources. Full, balanced, and efficient use of resources has been called "optimum use of resources."[10] According to the classical economists, the free play of competitive forces would automatically harmonize private plans and the optimum use of resources. The fact that this harmonizing did not occur, however, has resulted in the modern planning movement designed to implement plans of private enterprise and supplement them, if necessary, by public activity.[11]

Supplementing private enterprise by public activity, however, implies an expansion of governmental activity in modern economies. The part which technicians and public officials will be called upon to play as guides and advisers in a constantly changing social order should not be underestimated, but it should be realized that all they can do is to provide society with a choice of certain alternatives or routes. Society itself must make the ultimate decisions.[12] The role of governmental agencies, therefore, is one of coordinating various conflicting interests and attempting to secure effective cooperation among groups by agreement upon certain fundamental goals.[13]

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[9] Max Lerner, *It Is Later Than You Think*, Viking, 1938, chap. VI. Galloway points out that planning employed by great corporations is apt to be oligarchic, partial, and restrictive; by totalitarian states, dictatorial, militaristic, and authoritarian; while planning employed by democratic societies operates by democratic procedures toward social objectives set by representative bodies. (Galloway, *op. cit.*, p. 8.)

[10] "If a country were using its resources to the optimum, there would be no unemployment of men or machines except the minimum unemployment necessitated by seasonal production, transfer from one activity to another, and similar causes. The resources going into different uses would be in balance with each other and in relation to consumers' wants . . . and, finally, in doing any particular job, the minimum amount of resources would be used or consumed consistent with the job to be done. Thus, effective use of resources could be said to consist of full, balanced, and efficient use. . . ." (Gardner C. Means, "Basic Structural Characteristics and the Problem of Full Employment," in National Resources Planning Board, *Structure of the American Economy*, Part II, June 1940, p. 4.)

[11] Cf. Galloway, *op. cit.*, p. 9.

[12] MacKenzie, *op. cit.*, p. xvi.

Methods of Planning. Naturally, methods used in planning vary with type of planning, scope of the geographic, social, or economic area involved, objectives sought, agency of government to be the main coordinating or initiating agency, culture of the people involved, and related factors. Laissez-faire and planning may be found side by side in modern economies. The American economy is a heterogeneous mixture of large and small private enterprise, public and private competition, cooperation, and government ownership; but the basic mechanism relied upon to coordinate the entire economy is market price, increasingly modified by private administration, restrictions and controls used by monopolistic business units, government intervention, and some collective ownership.

The numerous techniques used to effect social planning include zoning, excess condemnation, public purchases, quarantine, taxation, eminent domain, soil conservation, and others. City and regional planners have developed techniques of land use, zoning, traffic control, building codes, land subdivision, and highway development. Land conservationists have devised methods of soil conservation, sustained-yield management of forest lands, development and effective utilization of water, grazing control and management, and proration and unit operation of petroleum fields.

Problems of Planning. Social planning involves all the problems—political, economic, social, psychological, technical, and legal—of human relations in modern industrial societies. Some of the more important political problems include (1) securing capable, intelligent and efficient government personnel through use of Civil Service or merit selection, rather than popular vote; (2) obtaining cooperation of local, state, and federal administrative officials in planning effectuation over areas involving more than one political unit; (3) obtaining legislative and judicial cooperation; (4) overcoming inertia or lack of interest among citizens and securing cooperation in the routine of administration; (5) securing public support in the form of funds and official interest to execute the planning program properly; (6) counteracting misuse of democratic rights by holders of key positions who may be working chiefly for private gain or advancement; and (7) administrative management of the increasingly difficult functions imposed upon the modern national unit.[14]

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[13] Many writers point out that the difficulty of agreeing upon the really fundamental goals may not be as difficult as it appears. "There is a possibility of bringing together into more effective cooperation a great multitude of aims in life that are at present merely through lack of lucidity, divergent and conflicting. . . . Much more agreement is possible among men upon the question of ends than is generally supposed." (H. G. Wells, *The Anatomy of Frustration: Part V,* "What All Men Seek," Harpers' Magazine, April 1936, p. 497.)

The major economic problem in social planning is to organize resource utilization and production and distribution to obtain a smoothly operating economy, yielding the highest levels of living possible with modern science and technology. Waste of resources because of ruthless exploitation, idle men and machines, and failure to use the most effective available technology is estimated to have caused the loss of 200 billion dollars' worth of goods and services during the period 1929–1937.[15] People must be taught to think in terms of working together, and more coordinated and desirable use of resources must be developed to prevent wastes of unemployment, depression, war, and exploitative practices. Such modifications in the culture of a people which has thought, acted, and lived for generations under a philosophy of rugged individualism is not simple, but is essential to the planning program in the United States.[16]

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[14] Galloway lists problems 1, 3, 4, 6 and 7. (Galloway, *op. cit.*, pp. 34–35.)

[15] National Resources Planning Board, *Structure of the American Economy*, Part I, "Basic Characteristics," June 1939, p. 2. The report explains the significance of the 200 billion dollars by stating that if all the idle men and machines could have been employed in making houses, for example, the extra income would have been enough to provide new $6000 houses for each family in the country; or, if the lost income had been used to build railroads, the entire railroad system of the country could have been scrapped and rebuilt at least five times. "Of such is the magnitude of the depression loss in income through failure to use available resources. It meant a lower standard of living for practically every group in the community."

[16] Galloway lists several factors conditioning the kind of planning undertaken or advocated—the scheme of institutions and habitual modes of thought, the propensity to identify the common welfare with the interests of groups to which one happens to belong, and ideals which are the "frames of reference." There are three such frames of reference in modern thought—the *competitive*, the *cooperative*, and the *collectivist*. Galloway points out that the competitive has been traditionally dominant, both ideologically and empirically, but that the material conditions which gave birth to this body of thought are rapidly passing. The cooperative ideal is now a powerful factor affecting thought and land utilization practices in many countries; but, according to Galloway, collectivism appears to be the "wave of the future" because, in one form or another, it is coming to dominate government and economy in the western world. (Galloway, *op. cit.*, pp. 37–40.)

CONDITIONS ESSENTIAL FOR SUCCESSFUL PLANNING

The success of planning efforts will be conditioned by numerous social, legal, psychological, economic, and technical forces. In many cases, statutes must be changed by new legislation, and some constitutional provisions must be modified if best use of resources is to be secured. Obviously, the nature of the planning program will be greatly influenced by current economic and social conditions and by physical forces: A program that would be most effective now in one region of the nation, may not be most effective at another time in the same region, or at the same time in another region. However, certain basic requirements must be met by any planning program which is to be successful in the United States.

Basic Requirements for Successful Planning in the United States. An effective planning program must meet the following requirements: (1) It must be *economically sound.* In the confused state of contemporary economic thinking, it is not easy to determine just what may be economically sound or unsound, and only one thing is certain—that many concepts of classical economics need to be modified if they are to be useful under modern conditions. Keeping the objective clearly in mind may be the most important single factor helping to determine the economic soundness of any given plan. (2) It must be *administratively workable.* (3) It must be *politically acceptable* to public opinion—a very important requirement in a democracy. (4) It must be *constitutional* in the eyes of the Supreme Court. (5) It must be *compatible with the American tradition and democratic principles,* and take account of geographic, political, cultural, and economic differences among various regions. (6) It must also be *capable of being symbolized and dramatized* so as to evoke more willing cooperation on the part of labor, agriculture, business, and government interests.[17]

The psychological and social difficulties involved in cultural changes necessary to insure effective planning are numerous and varied. Essentially, they involve a change of mental attitude—establishment of a philosophy of planning instead of a philosophy of "rugged individualism" or competitive exploitation. In most cases, technical problems involved are insignificant in comparison.

[17] For a more detailed analysis of these requirements, see *ibid.,* pp. 44 ff.

Attitudes Which Must Be Changed. Destructive land utilization practices can be corrected only by changes in the attitudes of land users, since practices are the outward expressions of controlling attitudes of mind. Many of these attitudes are deep seated, and some have been prevalent for many generations. In the course of time, however, these mental patterns tend to crystallize, and fail to take account of new conditions. Frequently they become so inflexible that desirable or necessary adjustments are prevented. Consequently, if land utilization practices are discovered to be ill adapted to the basic physical conditions, a satisfactory solution must include revision of some of the traditional ways of thinking as well as the encouragement of better land use practices.

The desires for security, stability, higher levels of living, and more opportunity for leisure, self-expression, and creative work are universal.[18] Methods of attaining these objectives must be continually revised with the economic and social changes caused by technical, physical, institutional, and social forces. The increasing tempo of economic life characteristic of modern machine technology has made these changes particularly numerous and far-reaching in recent years, and many attitudes hindering necessary adjustments in land utilization must be revised before land resource planning can be fully effective. Some of these attitudes are listed below.

(1) *That free competition accomplishes the necessary coordination of economic activities for various groups in society, and that planning is therefore unnecessary.* Under the assumptions of the traditional free market system, it is held that automatic forces promote increased productivity and interchange of goods among groups in society, so that the greatest possible gains for all the people result. As demand declines, prices are reduced until demand is restored, and the volume of production and exchange remains substantially the same. However, we have noted that free price competition no longer functions automatically in many segments of the economy, and that agriculture, for instance, is handicapped because it cannot establish the price-fixing or price-determination conditions characteristic of many other types of modern industry. The flexible price system of agriculture and the relatively inflexible or "sticky" price structure of industry promote exploitation of raw ma-

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[18] Cf. Great Plains Committee, *The Future of the Great Plains,* Government Printing Office, December 1936, p. 63.

terials (particularly of agricultural lands) and restrict industrial output. The result is great disparities between prices of raw and finished products.

Thus, effective planning, in the form of price control and output restrictions by certain industrial groups, necessitates effective over-all planning to secure more equal economic advantages for other groups where such planning through individual action is impossible. For example, the prosperity of agriculture depends partly upon adjusting agricultural output and partly upon adjusting industrial prices. To assume that free competition automatically accomplishes the necessary coordinating is naive. The fact that free competition no longer exists is in itself evidence that democratic over-all planning is necessary for the general welfare.

(2) *That what is good for the individual is good for society.* Classical economic doctrine held that society is merely the sum total of the individuals within it; that if each individual is allowed to pursue his own interests freely, he will naturally pursue those activities which will bring him the most returns or satisfactions; and that, since society is merely a sum total of individuals, the greatest social wealth possible will thus be achieved. Recent decades show that this does not hold true in actual practice. In the first place, society is more than the sum total of its individual parts; and second, an individual pursuing his own particular interests may interfere with the efforts of others to pursue their interests. When these individual interests conflict, some agency must reduce conflict and friction to a minimum so that all may satisfy their wants within certain limits, instead of permitting a few (to the exclusion of many others) to pursue their efforts toward achieving the greatest potential satisfactions.

As long as there were unused land resources, net social gain resulted when anyone turned them to productive use. However, as population increased and resources were more fully utilized, great wastes resulting from unrestrained private utilization of certain resources, such, for example, as forests and oil, have necessitated a more widespread appreciation of the fact that what may be good for the individual at the moment may not, in the long run, be good for the people as a whole.

(3) *That any public or group planning action is "dictatorship," "socialism," or "regimentation," and the antithesis of democratic living.* Many feel that the proper role of government is that of agent,

arbitrator, or "reasonable umpire" for the different groups in society, and that government umpiring is quite a different proposition from national economic planning.[19] The increased specialization of knowledge characteristic of the extended application of scientific methods is to improve man's life instead of bringing about serious maladjustments and chaos.[20] Planning of the right type—that is, democratic planning, as opposed to authoritarian planning—is the one effective means of preventing dictatorship, and it is class or special-interest group planning which brings about dictatorship. Over-all planning essential for democracies is implied in the kind of planning required for social control of land utilization.

(4) *That public expenditures or public activity cannot be as efficient or desirable as private spending and private activity.* An idea fixed in the minds of most Americans is that men in public office are corrupt, inefficient, and grafting "politicians," and it is true that the quality of much of our public service personnel in the past has not tended to disprove this conclusion. Such factors as the opportunities for making large fortunes in private business through exploiting the rich natural resources of a young country, together with the low salaries paid public officials, the absence of any merit system, and the fact that government service has been maintained on a popular vote basis instead of a professional basis have contributed to the encouragement of graft, "politics," and a low general standard for public servants. The tendency toward bureaucracy and "red tape" has also led many businessmen, especially, to conclude that any governmental activity could not possibly be administered or operated as efficiently as private activity under the assumptions of free competition.

Nothing about private spending, per se, makes it better than public spending; the efficiency and desirability of public activity depend entirely upon institutional arrangements, quality of personnel, and type of work undertaken. If planning is to be effective in the future, particularly in periods when economic activity stagnates and unemployment and depression occur, there must be no deep-seated prejudices against governmental public works and employment-stabilization activities if they are aimed at the prevention of chaos and economic disintegration.

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[19] Cf. Galloway, *op. cit.*, pp. 68–69.

[20] According to Dewey, the idea of a preestablished harmony between the existing "capitalistic regime" and democracy "is as absurd a piece of metaphysical speculation as human history has ever evolved." (See Dewey, *Freedom and Culture*, 1939, p. 72.) Ortega y Gasset points out the grave dangers of specialization resulting from extensive application of scientific method in *Revolt of the Masses*, (tr. from the Spanish), Norton, 1932.

(5) *That the owner may do with his property as he desires.* The concept that ownership gives the individual the right to do as he pleases with what is his own was fairly satisfactory during pioneer days; but when settlement became more congested and specialization, credit, and our modern interdependent economy became established, this doctrine was no longer valid. For example, if one man refuses to take proper care of his soil, the wind may blow his soil upon his neighbor's land and cause destruction of crops, or water may cause soil erosion from his field, which floods or buries the neighbor's crops, or it may carry seeds of noxious weeds to infest his fields.

We have learned that ownership carries with it definite duties or obligations, as well as rights or privileges. One of the duties of ownership is that property be utilized in ways not harmful to the rights of others; and unless this rule is followed, the owner's property may be taken from him, or his rights in it definitely restricted. Ownership should not confer an unlimited right to exploit, to waste, or to spoil; it is merely tenure at the pleasure of society, depending upon good behavior.[21]

(6) *That habitual practices are best.* There is a natural tendency for most people to be conservative, to follow customary practices which have proved satisfactory, to fear novelty and cling to the old or the familiar. In other words, there is a tendency to endure known evils rather than risk the consequences of a change. "Be not the first by whom the new is tried nor yet the last to lay the old aside," may be good advice, but it is extremely difficult to get society to assume a reasonable middle ground. Allegiance to the general principle, "Habitual practices are best," creates a serious social lag in effecting desirable and necessary adjustments.

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[21] For a more detailed treatment of the question of whether the rights of property carry with them the right to waste, see A. A. Bruce, *Property and Society,* A. C. McClurg, 1916. (Particularly chap. V, "The Doctrine of Public Necessity vs. the Principle of Feudal Relationship," and chap. VI, "The Right to Waste.") Under the social theory of property, society has the right to insist upon beneficial use, and beneficial use implies not only prevention of destruction or harm to the property of others, but of waste destructive to one's own self or one's own property. The right to suicide has never been acknowledged, for instance, on the grounds that society not the individual himself is the one to decide whether the loss of a given human life is harmful to it.

(7) *That professional planners or "experts" are highly impractical and not to be trusted.* The New Deal, inaugurated in 1933, which drew heavily upon specialists or trained professional workers in various fields for many public positions gave rise to derisive remarks from politicians and businessmen. Such experts were referred to as "braintrusters" or "supermen" and it was claimed that they were "academic," "theoretical," "impractical," "unrealistic," or "visionary." Universal education, extensive specialization, science and technology, and a democratic form of government create a general tendency to distrust "experts." Each individual who has mastered some limited field of knowledge feels free to criticize the fields of others, with the result that distrust of specialists or highly trained "experts" is apt to be general.[22] Under such conditions, allegiance to an overall plan is difficult to secure.

(8) *That man conquers nature.* The term "rugged individualism" has often been referred to with considerable reverence, on the grounds that it represents the self-help, aggressive, individual initiative which has developed a great nation of free men. However, rugged individualism, strictly speaking, means ruthless exploitation of natural resources. In a pioneer settlement, it is logical to assume that nature is something to be conquered if man is to survive. Superfically, of course, this is true. Unless trees are cleared, forested land cannot be used for cultivation of crops and production of food and clothing. However, ". . . civilization is not . . . the enslavement of a stable and constant earth. It is a state of mutual interdependent cooperation between human animals, other animals, plants, and the soil, which may be disrupted at any moment by the failure of any of them."[23]

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[22] For a very interesting analysis of this problem the student is referred to Jose Ortega y Gasset's *The Revolt of the Masses.* Gasset indicates that development of scientific method and more specialization of knowledge have made it increasingly easy for an ordinary individual to master a given segment of knowledge. By so mastering this small segment, he develops the illusion that he is a true scientist or scholar and competent to appraise or pass judgment on other fields of knowledge. In earlier times, when knowledge was not broken down into such small fields, a scholar had to master a great body of knowledge cutting across various fields. The fact that an ordinary individual now usually masters a given specialized field, combined with democratic forms of government, has, according to Gasset, developed the "mass man" or "mass mind," which is an extremely dangerous force in modern society. See also Harold J. Laski, *The Limitations of the Expert,* Harpers' Magazine, vol. CLXII, December 1930, pp. 101-110.

[23] Aldo Leopold, "The Conservation Ethic," *Journal of Forestry,* vol. XXXI, no. 6, October 1933, p. 635.

The true meaning of education is adaptation to environment, and it is essential that man adapt his practices to the basic natural forces which govern soil productivity, if he is to achieve an abundant and satisfactory life. It is true that the physical environment can be modified, within definite limits, by man's efforts; but man must also adapt his thinking and his practices if there is to be harmony between man and land. The concept that man can conquer nature will not lead to relationships which are as harmonious and satisfactory as those developing from a concept of cooperation with nature based on mutual dependence.

(9) *That natural resources are inexhaustible:* In a country like the United States, which possesses abundant natural resources, it is logical to develop the attitude that natural resources are inexhaustible. However, in a few short years many important minerals have been exploited to the point where there is a relative scarcity or shortage in prospect, and millions of acres of agricultural lands have been ruined through soil erosion and fertility wastage. Improved technology, lucky discoveries of other deposits, and development of satisfactory substitutes have offset or eliminated most of the more serious consequences of these wastes. An attitude of cocksureness and carelessness concerning natural resources has grown from the belief that new supplies will continue to be discovered when more of a particular resource is needed, or that a better product will be developed in the form of a substitute.

Even though extensive poverty and want have not resulted from our wasteful practices, society cannot condone as a national policy the failure to conserve resources which may be wanted or needed later. Unless it is generally understood that natural resources are not inexhaustible, but often limited in quantity or quality, and that it is wise to conserve them through sound utilization practices, the general level of living may eventually have to be reduced.

(10) *That immediate money returns are the one important measure of "success."* There has been a widespread tendency in the United States to emphasize materialistic gain to the exclusion of certain other amenities just as essential for a truly satisfactory life. The tendency to commercialize all forms of activity—even recreation—and to stress achievement of money fortunes has encouraged short-sighted exploitation and undesirable land use practices. Unless a more general appreciation of advantages of other than monetary returns is established, essential land utilization practices will be dif-

ficult to effect.[24] Too many highly commercialized, specialized operating units (particularly in the case of agriculture) do not establish the balance between the biological, physical, economic, and social forces which brings about permanent agricultural and industrial stability and satisfactory living.

(11) *That the individual must make his own adjustments.* In spite of the far-reaching changes in recent years, the assumption persists that the individual should, in general, be left to make his own adjustments to reverses, failures, and calamities. In the settlement of the United States, a man who failed in one occupation or became dissatisfied with his status in a given locality could move to a new area and begin over again. Migrating and beginning again were comparatively simple, because readily available free land resources were abundant.[25] Such a situation no longer exists, and the individual who suffers reverses or misfortune is now, for the most part, permanently handicapped.

Obviously, the only alternative is for the community, the state, and the nation to cooperate in controlling conditions which bring about such calamities, so that these will be eliminated or at least substantially reduced, and so that, where they do occur, these larger bodies will stand ready to assist in rehabilitating and reestablishing the individual. Widespread calamities occurring with little warning, and affecting thousands or millions of families at once, have necessitated a great expansion of community, state, and national activities and programs since 1930, and have caused much fear that such increased governmental activities will completely destroy self-interest and individual initiative. However, over a longer period of time society should be able to adjust so that individual initiative and public help and support can work harmoniously to bring about a more balanced, stable society. The direction of public activities along these lines requires the fullest possible use of the democratic process, and if democratic planning is not to be displaced by totalitarian planning or special group interest regimentation, there must be a common understanding and a common will to action through the cooperation of individuals and local, state, and federal governmental agencies.[26]

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[24] O. E. Baker concludes, "For the better utilization of our arable land, the writer has full faith only in the family farm, and in the family farm only in the case of the family with continuity of life and occupancy of the land. And continuity of land occupancy is dependent upon a philosophy of life." (O. E. Baker, "The Agricultural Prospect," in Parkins and Whitaker (ed.), *Our National Resources and their Conservation*, chap. IX, p. 233.) See also W. E. Hocking, "A Philosophy of Life for the American Farmer and Others," in U. S. Department of Agriculture, *Yearbook*, 1940, pp. 1056–1071. Hocking points out that philosophy is concerned with values—the things that make life worthwhile—and points out that the most dangerous feature of contemporary life "is not its transition, but the fact that in the course of change our capacity for serious thought has so far diminished."

[25] The same concept is implied in the phrase that the western lands were "a landing net for the unemployed."

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[26] Cf. Great Plains Committee, *op. cit.*, p. 67.

CHAPTER NINETEEN

FUTURE CONTROL OF LAND USE

SOME of the fundamental adjustments needed in the utilization of land resources in the United States were pointed out in Part IV. These adjustments involve comprehensive planning and action by government as well as by individuals. The preceding chapter indicated the principles which should govern such planning and action.

In order that the use of land resources can be controlled in the interests of the general welfare, full cooperation of private and public agencies is necessary. Each level of government—federal, state, and local—as well as private individual, corporate, and cooperative action, has a particular sphere of operations in which it can effectively further the necessary social control of land use. It is not a question of one agency rather than another agency, or of public versus private agencies, but of securing the joint cooperative effort of all.

LINES OF PUBLIC ACTION

Public land use control may take an almost endless variety of forms, and may serve a great variety of purposes. It is generally conceded, however, that adjustments between individual and social rights must be attained without the discouragement or destruction of private initiative. Some of the older European nations have attempted to develop an optimum of individual freedom combined with social control, on the grounds that public ownership or operation means political instead of economic control of production, and that, while the process of reconciling private control with social control is tedious and time-absorbing, it is desirable, in the last analysis.[1]

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[1] Cf. Karl Brandt, "Public Control of Land Use in Europe," *Journal of Farm Economics,* vol. XXI, no. 1, February 1939, p. 70. Brandt states that in Europe "For three generations the philosophy behind the scores of laws referring to land use has been that adjustments between the rights of the individual and of society as a whole must be attained in a manner which does not discourage or destroy private initiative." According to M. M. Kelso, discussing

Lines of Federal Action. Powers not specifically granted to the federal government nor prohibited by the Constitution to the states are reserved to the states. There is much overlapping of authority, and in many instances the federal government has undertaken activities which have not been specifically granted to it, but have grown out of more specifically delegated powers. The courts have upheld the constitutionality of these acts under general provisions such as the navigation or commerce clauses and the related implied "necessary and proper" powers. The complex problems accompanying a more mature, highly specialized, and technical machine economy, however, have given rise in the United States in recent years to a definite trend toward increased centralization, and the federal government has undertaken an increasingly large number of activities. In a few instances, these activities have been held unconstitutional and an usurpation of authority; but the seriousness and extensiveness of existing problems have usually caused the courts to interpret the law very liberally and to uphold most recent federal legislation, particularly that dealing with land use.

Because of its position as central authority of the nation, the federal government has definite advantages over state and local governments in certain activities associated with land use control. Financially, it has the entire wealth of the nation behind it, and is therefore much more powerful fiscally than any individual state government. Moreover, the increasing interdependence of economic groups makes the federal government the most logical agency for programs where group interests must be harmonized for the general welfare. However, certain dangers are associated with increased centralization of authority and expansion of federal activities; and there are many fields of land use improvement activity in which state and local government action or individual and group cooperative action are most effective.

Listed below are certain activities for which the federal government is the most logical and suitable agency. It will be noted that the most effective results in many of these spheres of action come from cooperation of federal, state, and local governments, or cooperation of the federal government with individuals, corporations, and

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Brandt's paper, "A great deal of education and 'trial by fire' will be needed before a web of land-use controls in the public interest will exist in this country in any degree approaching what now exists in Europe." (*Journal of Farm Economics*, vol. XXI, no. 1, February 1939, p. 73.)

cooperative associations or groups of private individuals. Because of its central status, the federal government is in a particularly strategic position to effect cooperative arrangements among various state and local agencies, private individuals, and groups in bringing about better land use practices, conservation of natural resources, and social control of these resources in the public interest. It is absolutely essential that a high degree of cooperation among these groups be developed if democratic forms of government are to be retained.

Land Acquisition in Marginal Areas. In marginal areas where the ownership pattern contains many small absentee-owned parcels, so that there is no common interest among different private landowners, it is frequently desirable and necessary to purchase outright most of the numerous small privately owned tracts, to secure the control necessary for establishing and maintaining correct land use practices. In certain range sections of the Great Plains, the cut-over regions of the Lake States, or certain sections of the Pacific Northwest, such large acreages are involved in public land acquisition programs that the federal government seems the logical agency to undertake such acquisition. It is the one public agency which has the capacity to provide adequate management and meet the costs involved. With few exceptions, counties or municipalities do not have the facilities to administer large public land projects, or funds to finance them. In most cases, state governments would find such financing a severe drain upon their resources, even if they were in a position to provide adequate management. Moreover, most of these public land acquisition projects affect the general interest and should, logically, be financed and administered primarily by the central government rather than the individual states.

Areas most suitable for public land acquisition ordinarily cover parts of several states, and federal acquisition will permit greater unification of policies—including appraisals, farm and ranch management enterprise relationships, and land utilization practices generally. Federal, state, and local governments have common interests in land eligible for public acquisition, because purchase of any given parcel usually serves a combination of objectives. The federal government, through grants-in-aid, or in-lieu-of-tax policies, can provide revenue for state and local governments formerly dependent upon tax revenue from the lands, and in this way can help meet the practical problems of fiscal support for local and state governmental services. In most cases, lands to be acquired have been chronically tax delinquent, returning little or no tax revenue to state and local taxing bodies for many years. State and local governments have an obligation to improve tax assessment and administration procedures, to prevent continued chronic tax delinquency, and also have definite obligations to improve tax-foreclosure procedures in order to provide for efficient acquisition of chronically tax-delinquent lands, and to cooperate closely with federal programs for the administration of lands which have come into county or state ownership.

The federal government should not purchase lands owned by the county or the states, unless, because of the failure of such agencies to cooperate in improving land use practices, the government finds it absolutely necessary to develop a constructive program of land utilization.[2] The student of land economics should keep continually in mind the fact that while soil conservation and grazing districts, zoning, and related land use controls may be effective for a certain time, or even for considerably long periods, they may nevertheless be terminated by local or state action, whereas federal ownership necessitates a more far-reaching, widespread change in public opinion before lands can be reopened to private acquisition and unwise practices. For example, in the case of zoning, state legislatures in cut-over or semi-arid regions may, after a few years of heavy precipitation or particularly favorable growing conditions, nullify early legislation enabling local governments to zone land uses. In the case of soil conservation districts, after passage of a limited number of years the members may vote to discontinue the district. Obviously, especially favorable growing conditions (which may be very localized and temporary) would be much more decisive in bringing about a change in social control of land use in these local and state situations than where federal policy was involved.

Under certain conditions, it may be desirable for the federal government to sell or otherwise delegate responsibility for administration and supervision of lands it acquires through purchase programs or other means. However, most lands acquired through federal land purchase programs (especially, the extensive areas involved in cut-over and semi-arid regions) should not be sold or subject to private entry, but should be owned and administered by the federal government through one or more of its recognized agencies. For example, in the case of marginal sections of semi-arid lands, the risks of private ownership, because of the hazards of variable growing conditions noted earlier, are such that an agency like the federal government can carry these risks and effect desirable land utilization practices much more easily than the average farm or ranch operator.

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[2] Cf. Great Plains Committee, *The Future of the Great Plains*, Government Printing Office, p. 73.

In areas where there is not enough federal land to justify establishment of Taylor Grazing Districts, the lands should be leased by the government to cooperative grazing associations in accordance with established land use practices. The federal government would obviously have the final word in approving rules, regulations, and policies concerning carrying capacity, rate of stocking, and other rules of the range, but should cooperate closely with local grazing associations in formulating such regulations and policies. The federal government should insist upon the right to establish regulations and policies in regard to prior use, dependency, commensurability, and preferential treatment of applicants for grazing permits.[3] In the case of forest areas, problems of securing approved use practices (especially sustained-yield policies) are such in many areas that public acquisition seems the most desirable solution. Such lands should be administered by the Forest Service, which has already established a record of fair dealing with private users of timber and range lands, and a systematic policy of sustained-yield management in the use of such lands.

Development of Land Resources. The federal government is in a strategic position to assist in financing projects which make basic natural resources more readily available. For example, the greatest natural handicap in the Great Plains area is lack of rainfall, and water must be made available through development projects in many areas. Stabilization of population on a satisfactory level and achievement of desirable land use practices often require improvements in storage of irrigation and stock water through construction of dams and reservoirs.

Since most of the more feasible irrigation projects have been undertaken by private and local groups, those projects that remain are for the most part high-cost, larger projects. Many dangers associated with development of water resources grow out of this fact. Construction of large irrigation projects is not only likely to involve high costs per acre, but is likely to result in developing a few thou-

[3] *Ibid.*, p. 74.

sand acres independent of adjacent dry farming and grazing areas. Best development of irrigation resources in semi-arid regions requires relating such irrigated areas to surrounding dry farming and grazing lands so that the whole area will be most effectively utilized, and so that intensive development of part of the lands to the exclusion of the others (with resulting extreme disparities in incomes, stability, and levels of living) will not occur. Moreover, development of medium-sized irrigation projects in conjunction with storage reservoirs on tributaries, or pumping plants on major streams, should be planned with a view toward integrating management of forage production for winter feed with that of adjacent grazing lands. This requires federal assistance, and should be an important part of the federal program of reclamation. In the aggregate, these smaller projects amount to large sums, and may be a significant factor in potential development and improvement of certain areas.

Some areas may be practically useless without drainage development, which often involves considerable sums, overlaps state boundaries, and requires technically trained personnel for its development and administration. In most instances, the federal government is the logical agency to undertake such development work.

The federal government should also endeavor to develop the greatest possible variety and stability of occupation and income in various regions of the country. For example, gradual development of vast lignite deposits in the northern part of the Great Plains may be feasible, and supplementary to an oil and gas conservation program in areas adajacent to the Plains; and development of these lignite deposits might be made to serve and provide occupation for the Plains population. Lignite for fuel and for power generation has been used successfully in Russian and Australian generating plants, and the federal government should establish demonstration projects and conduct further investigations to prove or disprove the economic feasibility of using lignite for this or other purposes.[4] Or, the federal government might set up pilot plants to test out, over a long period of time, means for obtaining shale oil efficiently.[5] These are but two examples of the possibilities in the field of developing natural resources in which the federal government, with its extensive technical staff and financial capacity, can be most effective. Development of recreational land resources and of multiple-use projects like forest and water resource projects should be an important part of a federal program. Such work should be particularly encouraged in areas within or contiguous to the cut-over forest areas, the semi-arid Plains, or the poorer, more overpopulated sections of the South where need for expanded economic opportunities is particularly great.

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[4] *Ibid.*, pp. 79–80.

[5] John Ise, *The United States Oil Policy*, Yale University Press, 1926, p. 431.

Resettlement. During recent years, many thousands of families have migrated because of droughts, unemployment, work in defense plants and war industries, and disappearance of basic supporting resources (in some cases mineral deposits, or forest). In most cases, these migrations have been involuntary and unsystematic. Individual families have not known where potential economic opportunities might be, or realized the nature of adjustments necessary in their new abode. Because of interstate problems involved, the federal government can most conveniently undertake responsibility for more intelligent and systematic resettlement in accordance with availability of economic opportunities.

Where land is to be acquired by the federal government to block out and secure improved land utilization, other areas of better economic opportunities should be made available for the families who sell their lands to the government. In other words, a place should be provided for these families to go, and they should be assisted in settlement before the government buys their holdings out from under them.

Great care should be exercised not to incur expenditures in the preparation of resettlement units so heavy that settlers are saddled with excessive overhead charges. Special precautions should also be taken against possible speculation in these resettlement lands by preventing passage of final title to private owners until certain conditions are complied with. Only those improvements considered essential for a reasonable level of farm living should be made before the individual family is settled, so that individual initiative can be utilized for further improvements of the resettlement unit. Federal agencies tend to incur unnecessary expense for improvements which do not necessarily increase the unit's income-producing capacity and could be made more satisfactorily later. Development of part-time employment opportunities to supplement farm income should be emphasized, as well as establishment of units combining enterprises which will furnish an adequate income for the family. State and local agencies, the federal government, and the individual families concerned must cooperate closely to provide the technical assistance and investigation required to operate such programs most effectively.

Control of Destructive Insect Pests and Diseases. Certain areas are periodically ravaged by such pests as grasshoppers, Mormon crickets, Japanese beetles, corn borers, boll weevils, and plant diseases which either destroy or greatly reduce the productivity of much arable and range land. Measures to control insect pests or plant diseases frequently require large expenditures for material and men, and eradication programs are even more expensive. More research is needed on host-plant associations, climatic relationships, and ecological conditions, and the federal government is in the best position to finance the major costs of such control and eradication programs, together with investigations and surveys essential for their operation. In many cases, costs of control or eradication are greater than the products destroyed, particularly in the case of individual operating units, so that individuals or local groups are unable to finance or operate such a program.

Investigations and Surveys. Perhaps the most important field of federal activity in connection with land use adjustments and social control is that of making studies or conducting research needed to provide the factual basis for better practices. The rapid changes—physical, as well as economic and social—in man's environment have increased the need for intensive investigation and study, particularly in marginal areas of cut-over and semi-arid regions. Facts upon which to base sound adjustments in resource use, operating units, land tenure, cultural practices, and institutional arrangements are often inadequate or entirely lacking. The federal government can, through cooperative research agreements and financial support of educational programs operative in the different regions, increase the effectiveness of research and investigations conducted by state and local institutions. This brief list of federal activities is merely a sample of the land use activities in which participation by the federal government is particularly desirable. Later in this chapter, the activities of specific federal agencies are mentioned under various types of land use control and development programs.

Lines of State Action. State governments have in recent years become alarmed at the increasing expansion of federal activities and authority, but the activities of state governments should often be complementary to federal activities. State governments can play important roles in effecting desirable land use adjustments. In the case of investigations and surveys, state research agencies and federal research agencies must cooperate fully to secure necessary facts and other details for sound control and land use adjustment programs. There is also need for each state to consider thoroughgoing legislation necessary for a comprehensive program of resource use. Laws, both permissive and mandatory, are required to implement many measures suggested by lines of federal activity, and many existing laws hinder achievement of the purposes of new specific legislation. The state should survey, simplify, and consolidate or codify all their legislation relating to resources (land and water) use.[6] This need is particularly apparent in the western states in regard to legislation affecting water use.

Needed State Legislation. Some of the more important land use legislation which each state should adopt includes: (1) A state coordinated zoning enabling act authorizing counties and other local governments to adopt rural as well as urban zoning ordinances. (2) Statutes to promote efficient and conservational use of water, especially in the West. These statutes should provide for minimum standards of design and construction, simplification of procedures for adjudicating water rights, and establishment of state agencies like state water conservation boards to cooperate with federal agencies and farmers in studying, planning, and financing new enterprises. (3) Soil conservation district laws, to permit formation of such districts in states where such legislation has not already been passed, and similar legislation to permit organization of cooperative grazing districts, weed control districts, and related types of collective tenure for the control of land use. (4) Revision or amplification of farm tenancy laws, including lease provisions for compensation for improvements and penalties for deterioration, etc., in cooperation with federal agricultural conservation and farm tenancy programs. (5) Statutes offering a procedure for revising structure of rural local governmental units. (6) Legislation to simplify existing procedures for collecting delinquent taxes and acquiring reasonable sound state or county title to chronically tax-delinquent lands. (7) Provision for state purchase of lands in the interests of land use adjustment. (8) Authorization of an appropriate state agency to survey and classify lands that come into public ownership through tax delinquency or other involuntary routes to make such lands available for private use and administration in accordance with best use. (9) Legislation providing for conservation and proper utilization of private forest and mineral lands, in cooperation with federal legislation establishing cooperative sustained-yield units (in the case of forest lands) and more stabilized and rational utilization of mineral resources. (10) Legislation to provide for proper development and utilization of recreational lands, including active cooperation with the federal government, through the Pittman Act, in wildlife management and development. (11) Legislation requiring scientific classification and assessment of private farm and city real estate, to reduce inequalities in tax burdens. (12) Legislation revising state tax systems for a more equal distribution of tax burdens and consequent reduction of tax delinquency, improper land use, and related maladjustments.[7]

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[6] Great Plains Committee, *op. cit.,* p. 80.

Other Important State Activities. Many of the above-mentioned types of state land use legislation will complement existing or necessary federal legislation to bring about more effective social control of land use. The federal government is in a position to give financial assistance and guidance along many of the lines indicated above but, because of constitutional limits, the states alone can adopt such land use measures as those listed. Some or all of these are required in every problem area of the nation. In addition to these types of legislation and to increased research and extension activities dealing with land use problems, including establishment of state planning boards to integrate research, educational, and action programs within the states, state governments can do much to bring about improved land use through increased appropriations for types of development such as provision of wells and small reservoirs for farm units in semi-arid regions, and specific appropriations for drainage and similar land improvement activities. In many instances, state governments could increase the effectiveness of land use adjustment programs by establishing state agencies with adequate appropriations to work cooperatively with similar federal agencies already operative.

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[7] Eight major types of state land-use legislation needed are listed in "State Legislation for Better Land Use," Special Report by an Interurban Committee of the U. S. Department of Agriculture, Government Printing Office, April 1941, p. xvii; see also Great Plains Committee, *op. cit.*, pp. 80–84.

Lines of Local Governmental Action. County, city, township, and school district governments are agencies of the state in which they are located, and do not possess sovereign authority except so far as it is delegated to them through state legislation. In those states where considerable authority has been delegated to local governmental units by state legislatures through home rule and related laws, local units can take the initiative in starting as well as operating many important land use adjustment programs. Even in these states, however, local units have been slow to take such initiative. Local governmental units should be the most active ones, since they are nearest to the people and feel most acutely the immediate effects of land use maladjustments. But the increasing impersonalization of modern society and the traditional hangover of antiquated forms of structural organization in local governments have made these agencies the least active or effective in adopting some of the more important and badly needed land use adjustments. This is a particularly serious weakness, because local units of government are frequently most practical for dealings with the land users or residents of an area. Adequate land use adjustment programs should include all units of government, in appropriate combination.[8]

One of the best examples of the failure of local governmental units to show leadership and initiative in handling acute land use problems is seen in the management and proper administration of chronically tax-delinquent and tax-reverted lands. County officers have often failed to acknowledge the root cause of delinquency—that is, overassessment or unscientific assessment resulting in great disparities between capitalized income value and tax burden levied. They have taken tax title and then sold the land at a low price to private buyers and, when the land has been returned to the tax rolls, have again assessed it at excessively high levels.[9]

No doubt one of the reasons why local governmental units have been slow to develop more intelligent policies in such instances is the structural organization of county government, which is characterized by absence of any effective coordinating head, many independent collective administrative offices, general lack of any special qualifications or training for office, short terms of office, and numerous small counties with small valuations. Some of the same weaknesses apply to municipalities and township and school district units. Township and school district units are ordinarily so small that they lack the vision and financial capacity to initiate or operate any far-reaching or adequate land use adjustment programs.

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[8] Cf. "State Legislation for Better Land Use," p. 113.

[9] For example, in one Montana county, the same piece of land had gone to tax deed three different times in 16 years, and in each case the commissioners sold the land cheaply to get it back into private ownership, then assessed it at 3, 4, or as high as 15 times its capitalized income value. This caused it to go delinquent again, and the whole process of tax-deed foreclosure and resale was repeated.

In those states where enabling legislation has not been adopted to permit various reforms and improvements in structural organization of local governmental units, or to permit these local units to initiate and administer various land use adjustment programs, such state legislation is obviously the first need. However, in many states where such legislation has been adopted, local governmental units have not taken advantage of the authority so granted. Counties—particularly in more marginal areas like the cut-over sections and the semi-arid Plains—should undertake reclassification of land for assessment purposes, revise organizational structure, and lower operating costs. Consolidating many of the smaller units of local government (such as the numerous small school districts in some areas) would do much to increase the effectiveness of local government, and improvements in city government along the lines of the city manager or centralized executive system would improve urban government and reduce its costs. Local governments can do much to secure more widespread adoption of desirable land use practices by specific appropriations, and by educational work organized around the local governmental unit structure.

LINES OF PRIVATE ACTION

The types of public action outlined above would do much to improve utilization of land resources. However, it must be recognized that, in the last analysis, adjustments must be effected by the individual land user, on his individual holding. In other words, these public programs will be effective only insofar as they are incorporated into the thinking and actions of land users.

Individual Action. In any effective land use adjustment program, numerous changes must occur in the utilization practices of the individual operator. For example, in the case of agricultural land, the individual farmer must make numerous specific changes in the organization of his farm and in his farm practices. In a similar way, the urban homeowner, businessman and industrialist, the private forest owner, the miner, and the resort owner must make specific changes in the organization and operation of their units. Unfortunately, a very small percentage of all operators ordinarily adopt recommended practices voluntarily and promptly, and there is a relatively long lag between the time when recommendations are made and when their adoption and use become widespread. This lag is a very serious factor in securing improvements in the use of land resources and tends to force the imposition from above of more extensive and aggressive public programs.

Some specific examples of what individual land users can do can be observed in the case of agricultural land. Farmers can do much to improve the productive ability of the soil by following approved soil conservation practices like contour plowing, terracing, rock tillage, use of cover crops, recommended rotations, and related practices. In many cases, small stock reservoirs or small dams to supply water can be built by the individual operator to furnish water supplies for garden products and supplementary feed. Through proper stocking of the range and systematic provision of feed and seed reserves in good years, to be used as protection against the poor years, the farm economy can be made more stable, particularly in semi-arid regions or areas where great variations exist in growing conditions, and where natural forces are particularly important.

Cooperative Effort. Individual land users can improve their economic condition by grouping together in cooperative associations for the purchase of supplies and products needed for consumption. This will help to secure the improvement in financial conditions necessary to reduce slum situations and improve levels of living generally. In many agricultural areas, individual operators can, through cooperative grazing districts, soil conservation districts, weed control districts, and related units, help to bring about a more properly balanced use of the land and more adequate farm and ranch incomes. Cooperative action of land users is essential in most instances to secure improvements in assessment and land taxation practices by local and state tax officials.

It has been too widely assumed in recent years that expansion of governmental activity has made it unnecessary and undesirable for the private individual to take any initiative in starting or operating various desirable practices. It is more, rather than less, true that in these days full responsibility of each private individual is essential for the effective utilization of resources. The many local, state, and federal programs merely help the individual, through cooperation with his neighbors, to increase the effectiveness of his efforts. If he fails, through ignorance, inertia, or lack of initiative, to take advantage of these opportunities, land use control programs are more and more likely to be initiated and administered from the top down, rather than from the roots up, with the result that democratic processes may disappear completely.

Corporate Action. Large private corporations have exerted a strong influence toward certain methods of utilizing land resources in recent years. These agencies are in an increasingly effective position to be an influence for improved land use, if they so desire, and possess many advantages over the private individual. They operate on a relatively large-scale basis, have a continuing management, are longer-lived, have greater financial reserves, and in general are in a better position to effect desirable land use adjustments than most private individuals. The greater use by such large private corporations of policies working in harmony with the social interest rather than purely for selfish or temporary gain, is particularly desirable, and would be a most effective way of preventing too rapid expansion of governmental activity (particularly of the federal agencies) in land use control efforts. Unless private agencies, both individual and corporate, can work out effective land use control programs by utilizing information and opportunities made possible through public legislation and public support, governmental activity in the social control over land use will expand at the expense of private activity.

SOCIAL CONTROL AND PLANNING ACTIVITIES

Numerous private, public, and semi-public planning agencies in the United States today exert some influence upon the use of land resources. Private business organizations carry on some planning activities, largely in connection with their special interests. These activities, however, have an important bearing upon land use practices adopted and the methods and effectiveness of various land use control programs undertaken in the public interest. The following brief description of some of the more important public agencies indicates the nature and scope of land use planning and social control activities in the United States, and the serious need for more coordination of these public and private activities.

Urban Planning Agencies. Almost all cities of the United States with populations over 100,000 have official city planning commissions and there are more than 700 official and unofficial city planning agencies in the nation.[10] Most of these agencies are concerned with planning the physical organization and development of urban areas as units to promote better community living. The whole field of city planning, including the control of platting, zoning of buildings, traffic development terminals, parks and recreation centers, civic centers, and financial budgets and programs are items to which these agencies devote most effort.

The National Resources Board found that the limitations of urban and metropolitan planning lie particularly in our system of land valuation, our methods of urban land taxation, and the general economic and social forces which shape municipal financing and policy. The precarious financial condition and lack of recognized legal status of city planning agencies is also an important factor contributing to the limited effectiveness of urban planning.[11]

Local Planning Agencies. Planning and social control of land utilization at the local level outside of cities have been practically non-existent until recent years. The rural zoning movement is only a few years old and at present is limited to counties in a mere handful of states. Town zoning in New England and neighboring states has been used largely for urban purposes. Soil conservation, grazing, weed control, and related districts promise effective rural local land use planning and social control, but they are too recent to make any conclusive appraisal possible at this time. Through the agricultural land use planning program initiated by the federal government in 1938, agricultural planning committees were set up in hundreds of counties and often in communities or neighborhoods within the counties. Most of the county planning committees established by state planning boards in the thirties were very short-lived, and have contributed little to the solution of land utilization problems, either urban or rural.

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[10] The National Planning Board early in 1934 found that there were 717 official and 22 unofficial city planning agencies. (National Planning Board, *Final Report, 1933–34,* Government Printing Office, 1934, p. 74.)

[11] *Loc. cit.*

State Planning Boards. State planning boards are of recent origin in the United States, some 41 states having created such boards during the seven months, December 1, 1933, to July 1, 1934. Many of these have since been abolished or their appropriations so reduced as to make them practically ineffective. Too many state planning boards were created principally with the idea of getting as large a share as possible of federal public works and relief expenditures during the depression thirties, or were organized with programs too general for effective support. Today, in states where state planning boards are active and well financed, they are undertaking very specific activities for the betterment of land resource use in the public interest. Some planning boards are making surveys to determine the nature and extent of certain land resources; or analyzing problems of relief and stranded populations, the possibilities for resettlement and development of economic opportunities for such stranded families, the possibilities of power and industrial development, methods to secure improved land tax and credit policies, and possibilities for greater coordination of state and federal planning activities.

Regional Planning Commissions. The activities of state planning boards in dealing with certain problems of resource use have established the fact that local projects often cannot be undertaken successfully unless they are part of regional programs or projects. Consequently, there have been developed regional commissions or boards like the Pacific Northwest Regional Planning Commission, the Missouri Valley Planning Commission, and the New England Planning Commission. For example, the Pacific Northwest Regional Planning Commission, comprising the states of Idaho, Montana, Oregon, and Washington, was designated to coordinate the activities of these states in connection with industrial, power, agricultural, and related economic resources in the Columbia River Basin.

Federal Agencies. There are some 200 bureaus in the various departments of the federal government and its numerous emergency organizations, established either on an independent basis or as adjuncts to existing departments. Some of these take direct part in making national policies and may be considered "planning agencies" in the most limited sense. They are concerned with geophysical planning for the conservation and effective utilization of natural resources. The federal government has long recognized its opportunities and responsibilities in this field, and has undertaken and is undertaking numerous activities concerned with planning, conservation, and utilization of all of the different types of land. There are at least 29 federal agencies concerned with land utilization, of which 22 are directly engaged in land administration and land planning, and 7 with functions related to the work of the agencies engaged in land acquisition, land administration, and land planning.[12]

Three agencies of the federal government include in their functions attempts to coordinate the land planning activities of various other federal agencies. They are: (1) the Bureau of Agricultural Economics (in the Department of Agriculture), which, in coordination with agencies of the Department of Agriculture and with state and local agencies and farmers, is responsible for the preparation of long-time and annual agricultural plans and programs; (2) the Office of Land Use Coordination (in the Department of Agriculture), which is responsible for providing administrative coordination in Washington and in the field among the several land use agencies of the Department of Agriculture, between the activities of these agencies and of state land use agencies, and between the planning activities of the Bureau of Agricultural Economics and those of the agencies effectuating such plans and programs; and (3) the Land Policy Committee (in the Department of the Interior), which is responsible for advising the Secretary on land policies and for coordinating plans and activities of agencies in the Department engaged in land acquisition, administration, or planning. Until it was abolished in 1943, the National Resources Planning Board had as its function the coordinating of land programs of various federal agencies and integrating them with those of various state agencies.

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[12] A survey by the National Resources Planning Board in 1939 revealed 22 agencies directly engaged in land acquisition, land administration, or land planning, distributed as follows: Department of the Interior, 8; Department of Agriculture, 8; Federal Security Agencies, 1; Executive Office, 1; independent agencies, 4; and 7 agencies whose functions are closely related to administration and land planning, distributed as follows: Department of the Interior, 2; Department of Agriculture, 2; Department of War, 2; Department of Commerce, 1. (The lists of the agencies engaged in various land acquisition, administration, or planning activities such as soil surveys, soil erosion, conservation of wildlife, etc., have been taken from a mimeographed release of the National Resources Planning Board, Washington, D. C., July 25, 1939.)

Agricultural Land Use Planning. The federal government, through its Department of Agriculture, has attempted to coordinate the work of all federal agencies dealing with agricultural land use planning. Under the Mt. Weather agreement (1938) the U. S. Department of Agriculture and the state land grant colleges agreed to undertake cooperatively the task of helping farmers establish the necessary organization and program-planning procedures to bring about improved agricultural land utilization practices. Almost all national and state agricultural programs bear directly or indirectly upon the use of land, and land use planning is thus the logical place to begin the work of coordination.[13]

Some idea of the number and types of federal and other agencies concerned in planning agricultural land utilization can be obtained from the personnel of the state and county land use committees suggested under the Mt. Weather agreement. The state land use planning committee was to consist of the director of the state agricultural extension service, the director of the state experiment station, AAA representatives, the state coordinator of the Soil Conservation Service, the state director of the Farm Security Administration, representatives of the Bureau of Agricultural Economics and the Forest Service, other state and federal department representatives, and a number of farm people from various types of farming areas within the state. In addition to this state committee, the Mt. Weather agreement suggested a county land use planning commitee in each agricultural county in the nation. This county committee was to consist of about ten farm people, a few forest owners (in counties where forestry is a problem), the county agricultural extension agent, at least one member of the local AAA administrative committee, the county Farm Security supervisor, and any other local, state, or federal officials responsible for the administration of a land use program in the county.

Development of this new type of coordinated effort made it clear that the Department of Agriculture itself needed a central planning agency. The Department was reorganized and the Bureau of Agricultural Economics given the responsibility for the general planning work of the Department, through the Office of Land Use Coordination and the Division of State and Local Planning.[14]

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[13] U. S. Department of Agriculture: "Land Use Planning Under Way," July 1940, p. 3. Representatives of the Department of Agriculture and the land grant colleges met in the summer of 1938 at Mt. Weather, Virginia, and the outcome of the meeting was a statement of understanding known as the Mt. Weather agreement.

Forest Land Use Planning. In the case of planning associated with forest and timber resource utilization, the federal government plays an important role. The Forest Service has taken a leading part in developing the concept of forest protection, sustained-yield forest management, permanent forest industries, and stable forest communities. Several other federal bureaus and other agencies, however, have had an active part in shaping forest policy, including (1) the Bureau of Agricultural Engineering, in connection with soil erosion control, irrigation and drainage development, and related engineering activities; (2) the Bureau of Biological Survey, concerned with maintenance of mammal and bird reservations, food habits of birds and animals, and related biological investigations; (3) the National Park Service, dealing with administration, development, maintenance, and improvement of national parks and monuments; (4) the Soil Conservation Service (an outgrowth of the Soil Erosion Service), which is concerned with soil erosion control projects and soil conservation programs (see Chapter XIII); (5) the Geological Survey, concerned with classification of public lands and examination of their geological structure, mineral and water resources, and products; (6) state forestry boards and commissions; and (7) the Lumber Code Authority, a semi-public agency established to work closely with state and federal organizations responsible for the enforcement of state and federal laws dealing with forest practices essential to conserve and sustain production of forest resources. The Lumber Code Authority enforces such rules in cooperation with the appropriate governmental agencies.

Planning Utilization of Recreational Land Resources. The increased use of land resources for recreational purposes has increased the tendency of certain governmental agencies to give more consideration to aspects of land acquisition, administration, and planning activities which affect the use of these lands for recreational purposes. Thus, the Forest Service has recently given increasing attention to ways and means by which lands under its supervision may be developed to increase their usefulness for recreation. The National Park Service, through improvements it has made and policies it has developed in the use of recreational land in the National Parks, has been an important factor accounting for large increases in use of these areas in recent years. In some cases, as, for instance, in Olympic National Park, some contend the Park Service has gone too far in taking over land. The following agencies concerned with conservation of wildlife are helping to increase the recreational land resources of the nation: The National Park Service, the Division of Grazing, the Office of Indian Affairs, the Bureau of Biological Survey and Bureau of Fisheries in the Department of the Interior; the Forest Service and the Soil Conservation Service in the Department of Agriculture; and the Migratory Bird Conservation Commission (an independent agency). The Civilian Conservation Corps has also done much in recent years to improve recreational land resources.

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[14] For a more detailed statement of the reorganization of the Department of Agriculture necessitated by changes in emphasis given various types of work, and particularly in regard to the greater emphasis placed upon land use planning, see M. S. Eisenhower, and R. I. Kimmel, "Old and New in Agricultural Organization," U. S. Department of Agriculture, *Yearbook,* 1940, pp. 1125–1137. Within the Department of Agriculture, planning organization included the Agricultural Program Board and the Interbureau Coordinating Committee, composed of representatives of all Department of Agriculture agencies.

Planning Utilization of Mineral Resources. During the First World War, the control of resource use by the United States Fuel Administration was one of the striking examples of a highly developed system of control over prices, wages, distribution, and consumer priorities. After the war, the Federal Oil Conservation Board (consisting of the secretaries of the Interior, the Navy, War, and Commerce) was set up in 1924. This board did much to point out wastes of unregulated competition and utilization of mineral resources.[15] Passage of the National Industrial Recovery Act in 1933 made the federal government responsible for planning for the mineral industries on a broad scale, under regulations like the oil and coal codes administered by the Petroleum Administration Board. The National Resources Planning Board during its existence devoted a technical section to developing a general mineral policy for the nation.

Some of the agencies concerned with planning, conservation, and use of mineral resources at present include the Bureau of Mines (in the Department of the Interior) which investigates methods of mining, treatment of ores, and prevention of accidents and wastes. This bureau controls the production of helium, and during war issues all licenses covering the manufacture and possession of explosives and ingredients. The Geological Survey (also in the Department of the Interior) classifies public lands as to geological structure, mineral and water resources, and products of the public domain. It also enforces mineral leasing laws. The Federal Oil Conservation Board investigates ways and means of safeguarding the national security through conservation of oil. Mobilization of land resources, particularly of minerals, is essential for conservation in peacetime and for an ample stockpile in wartime.

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[15] National Planning Board, *Final Report,* p. 79.

Planning Utilization of Water Resources. Numerous agencies are concerned with the study of water-flow problems and the development of a program for best utilization of water resources.[16] These include the Forest Service and the Bureau of Agricultural Engineering in the Department of Agriculture; the Department of Commerce's Coast and Geodetic Survey, which surveys the coasts of the United States and its possessions, and surveys rivers to the head of tidewater; the General Land Office; and the Bureau of Reclamation, the Soil Conservation Service, and the Water Resources branch of the Geological Survey, in the Department of the Interior. This latter agency is concerned with gauging streams and determining the water supply of the United States, including underground currents and artesian wells. It operates 2800 federal and state cooperative gauging stations. There are also the Hydrographic Office in the Bureau of Navigation (in the Department of Commerce); the Board of Engineers for Rivers and Harbors, the Mississippi River Commission, the California Debris Commission, the Northern and Northwestern Lake Survey (in the War Department); and the following independent commissions: the Federal Power Commission, the Tennessee Valley Authority, the Mississippi Valley Committee, and others.

Regulation and Development of Transportation. Numerous agencies are concerned with regulating and developing transportation, but not until recent years has there been any systematic attempt to coordinate and plan the transportation system. The first real step was taken in 1933 with passage of the Emergency Railroad Transportation Act, which established the Office of Federal Coordinator of Transportation. Duties of this office are to coordinate the activities of the nation's railroads in order to eliminate waste and preventable expense, and to improve transportation conditions by promoting joint use of transportation facilities.[17]

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[16] The information and data covering the agencies concerned with planning forest and timber resources, utilization of water resources, mineral resources, and regulation and development of transportation and general land use planning, have been taken from *ibid.*, pp. 75–81.

The following agencies are concerned in one way or another with the regulation and development of transportation: the Bureau of Public Roads in the Department of Agriculture; five agencies in the Department of Commerce (including the U. S. Shipping Board Bureau, the Aeronautics Branch, the Division of Lighthouses, the Division of Navigation and Steamboat Inspection, and the Transportation Division of the Bureau of Foreign and Domestic Commerce); the Alaska Road Commission and the Alaska Railroad Division in the Department of the Interior; in the Navy Department, the Bureau of Navigation; in the War Department, the Board of Engineers for Rivers and Harbors, and the Mississippi River Commission; and the Interstate Commerce Commission, the Inland Waterways Commission, the Federal Coordinator of Transportation, the Panama Canal and Railroad Corporations, the Civil Aeronautics Authority, and other independent agencies.

THE FUTURE—A PROBLEM OF COORDINATION

It has been noted that some 29 federal agencies alone are concerned with the work of land acquisition, land administration, and land planning. This large number of federal agencies, in addition to the many other public and private agencies noted, has tended to create confusion, since many of the agencies have been guided by different ideas and conflicting policies, and their efforts have lacked close coordination. In an effort to bring about a greater degree of coordination, 4 federal agencies—the National Resources Planning Board, the Bureau of Agricultural Economics, the Office of Land Use Coordination, and the Land Policy Committee—have made special efforts toward more integration of land programs on federal, state, and local levels. In spite of these attempts, the problem of coordination is still very serious, and it is in this field that really significant future developments in land use planning and social control must occur.

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[17] *Ibid.*, p. 80.

The Need for Coordination. The preceding sketch of planning agencies is not presented as a complete inventory, but merely to indicate the vast amount of effort devoted by numerous agencies to policies and programs for the most effective use of our natural resources. This sketch is sufficient to show that many of these planning activities are "... scattered and lack cohesion either in relation to a definite system of national aims or in relation to performance.... There is obvious need for coordination of these activities. None of the coordinating agencies described has either the powers or the resources for surveying the national scene as a whole and for discerning how it is shifting and what are the forces which may be harnessed to give it direction."[18]

In general, the concept of coordination apparently followed is that all that is necessary is to form a committee representing different bureaus or agencies and have them accomplish "coordination." The problem is not so simple, however, but is one of the "most complex and difficult problems both of policy-making and of administration."[19] Effective coordination in a democratically organized nation necessitates a more general understanding of the true meaning of coordination and methods by which it can best be achieved.

The Meaning of Coordination. There has been much confusion and misunderstanding over the term "coordination." In the minds of many individuals, coordination and cooperation are apparently identical, and correlation and integration have often been used interchangeably with coordination. However, coordination has a specific meaning of particular significance in the development of effective land use planning and social control.

Coordination means *adjusting* or *harmonizing,* while cooperation means *working together*. Cooperation is necessary for effective coordination, but coordination is a step beyond cooperation. Correlation is the establishment of mutual relationships and represents a step in the consideration of coordinating procedures. To integrate means primarily to unite separate parts into a whole; and as correlation is the beginning, integration is the end or objective of the coordinating process."[20]

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[18] *Ibid.*, p. 84.

[19] *Loc. cit.*

Since cooperation is the basis on which coordination must be built, it is important to have a comprehensive understanding of the basic principles underlying successful cooperation.[21] Cooperativeness is, of course, primarily a mental attitude, and is much more highly developed in some individuals than in others. However, most people are reasonable, and are willing to undertake cooperative activity if they recognize its advantages. It is generally realized that cooperation is not a remedy for all problems, but that it does offer specific personal, technical, and financial advantages, under proper conditions. It should be borne in mind that cooperation is encouraged and advanced by mere association and conference of individuals, institutions, and organizations on problems of common concern. The advantages of cooperation lie in three major fields—promotion of better institutional and individual spirit, more effective advancement of knowledge, and important savings of time, money, and materials.[22]

Methods by which Effective Coordination can be Achieved. Since cooperation is the foundation for effective coordination, and since cooperativeness is primarily a matter of mental attitudes, the problem of coordination is to a large extent a problem of personnel and psychology. However, important as the matter of personnel is, other problems involved are also important. In the first place, a sincere effort must be made to organize, and to obtain agreement on objectives and methods. In other words, there must be some common objectives or goals to which all agencies, institutions, or individuals can give common allegiance.

The rapid rate at which the United States has been settled and developed, and the emphasis upon resource exploitation and material gains, have not contributed to developing conditions of deliberation and discussion making for a careful consideration of ideas concerning common objectives. The emphasis on individual initiative in a pioneer stage has served to develop the nation rapidly;

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[20] Cf. Carleton, R. Ball, "Coordination of Agricultural Activities," a lecture before the School for Extension Workers, Kansas State College, Manhattan, Kansas, April 13, 1939. (Mimeographed.)

[21] Ball sets forth ten principles for successful cooperation. (*Ibid.*, pp. 5-6.)

[22] Ball points out in some detail the distinctive ways in which cooperation accomplishes these objectives. (*Ibid.*, pp. 6-7.)

but effective coordination requires a series of intermediate stages or points at which ideas, policies, procedures, and activities can be brought together into a working relationship. Group action, discussion, and thinking are essential; and these have not been the primary methods by which the American economy has operated.

Merely bringing together committees or representatives of specialized groups, agencies, or institutions is not enough to achieve effective coordination. Too often, these individual representatives are too busy or absorbed in their own specialized problems and programs to give adequate attention to the achievement of effective coordination. It is necessary to make coordination a full-time job for specially qualified men, and to set up structural organization or arrangements through which the work of such individuals can be effected.[23]

Personnel problems are, of course, in the last analysis, matters of mental attitudes. Human relationships vary all the way "from active antagonism, through self-centered indifference, to free interest, and finally to planned cooperation. . . . One type of relation may prevail at one time or in one place while another prevails at the same time in another place or in the same place at another time. Attitudes precede action."[24] By and large, however, free interest generally prevails among individuals; and human progress is characterized by an increasing recognition of social values and responsibilities. Although the many new agencies and programs established in recent years have tended to produce confusion, it is generally recognized that cooperation among individuals and groups in society has increased. Effective coordination or harmonious adjustment of individual group programs within the economy can be accomplished, is in a small way being accomplished, and ultimately must be accomplished completely. Personalities are the single largest factor in cooperation, and therefore in coordination.[25]

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[23] Cf. National Planning Board, *op. cit.*, p. 84.

[24] Ball, *op. cit.*, p. 9. See also Max Lerner, *Ideas are Weapons—the History and Uses of Ideas*, Viking, 1939.

[25] Ball has suggested a formula for effecting a complete coordination of activities which can be applied to land use planning and social control, "Take two cups of desire for more efficient and least expensive service to citizens; add two cups of willingness to cooperate, one cup of patience, one-half cup of belief in democratic processes, a heaping tablespoonful of common sense, a heaping tablespoonful of reasonableness. Stir slowly until thoroughly mixed, season to taste with tolerance and good humor. (Let the hesitant member lick the spoon.) Bake twelve weeks in a slow oven; serve hot with conciliation sauce." (Ball, *op. cit.*, p. 25.)

Coordination of Research and Education. The securing of sound information concerning forces, problems, and trends is basic to long-time effective coordination of social control and land use planning activities. It is essential, therefore, that research and educational agencies coordinate their work in such a way as to make most effective use of funds, personnel, and resources. Unfortunately, there has been a definite lack of cooperation and coordination of research and educational activities in the United States. The federal government, through its Office of Experiment Stations in the U. S. Department of Agriculture, cooperates with state experiment stations in agricultural research. Passage of the Bankhead-Jones Act to make available additional funds for greater coordination of research between the federal government and the states is one of the recent achievements of the federal government. Some of the factors which are considered to be most responsible for lack of fuller coordination in research programs are: geographic isolation; (2) inability of workers to confer frequently; (3) cost; (4) conflict with local obligations; (5) lack of coordinating leadership; (6) institutional pride and professional jealousy; and (7) problems of personnel relationships.[26] However, most leaders would agree that the situation is improving and has been distinctly better in recent years than formerly. The acknowledged lack of coordinating leadership is a definite challenge to achieve more effective education in the entire field of social obligations and human relationships.

One of the purposes of education is better adaptation of the individual to his environment; and in a democracy it is particularly vital that an efficient system of universal education and equal educational opportunities be established at all educational levels. Studies reveal great inequalities in educational opportunities and facilities at grade and high school levels among local units within a state, and among states. In recent years, efforts have been made to achieve a more equal distribution of the burden of school through increased federal and state aid. Considerable progress has been made within some states, but there is much room for improvement.

The serious condition of American agriculture at the beginning of 1933 resulted in large increases of federal aid to American farmers. Many new agencies established included the AAA, the

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[26] L. E. Call, "The Planning and Coordination of Research Projects," *Proceedings of the Annual Conference of the Association of Land Grant Colleges and Universities,* November 18–20, 1935, Washington, D. C., 1936, pp. 91–95.

Rural Rehabilitation and Resettlement Work which later became the Farm Security Administration, the Soil Conservation Service, the Farm Credit Administration, and numerous others. In the field of urban land utilization, numerous government agencies, including the Home Owners Loan Corporation and the Federal Housing Authority were established; and in the fields of employment stabilization and industrial and power development, many new agencies have been created. In addition, older agencies of the government have focused their work more directly on the social and economic ills of agriculture, labor, and industry. All these new agencies and this redirection of effort have ushered in a program of action which has created some confusion and certainly has made necessary a harmonious adjustment of these activities so that the entire effort can be most effective in improving the general welfare. Instead of a piecemeal attack, there is a definite need, through discussion and deliberation, to unify these programs on the local and individual levels so that the problems of the individual land user and the neighborhood or community can be attacked in a balanced, complete, and systematic fashion. Only to the extent that mental attitudes can be developed, through education, can action program coordination and improved land use be accomplished.

Some Accomplishments as Illustrated by County Agricultural Planning. Reference has already been made to the efforts of the Department of Agriculture to coordinate the work of the department through the county agricultural land use planning program. The county agricultural land use planning program represents a sample of concerted effort to bring about effective coordination through discussion and mutual agreement. Coordination of action, it is felt, can best be achieved through joint participation of farmers, technicians, and administrators in cooperative planning.

Although county agricultural land use planning was active for but a relatively short period prior to the Second World War and was almost completely inactive during the war, some significant results have been accomplished.[27] Through participation of several thousand farm men and women[28] in several hundred counties and thousands of communities, there has been much thought and discussion of farm problems. This accomplishment in itself is of great value, but during the first year of this new effort, some very concrete accomplishments were also achieved.

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[27] County agricultural land use planning was formally inaugurated with the Mt. Weather agreement in 1938 but was discontinued on a wholesale basis by the U. S. Bureau of Agricultural Economics in 1942. Whether this discontinuation is a temporary war casualty or a permanent discontinuation is a matter of conjecture. (Neal C. Gross, "A Post Mortem on County Planning," *Journal of Farm Economics,* vol. XXV, no. 3, August 1943, pp. 644–661.)

In Teton County, Montana, in developing a basic plan of land use for the county the county committee determined that 20,000 acres of land then in wheat were unsuited for this crop. After studying the history of the area and the prospects for wheat growing, the committee decided that the land should be used for grazing, and that all similar land should be kept out of cultivation. With this general objective, the committee attempted to determine what agencies could help, and in what ways. Through the agency representatives on the county committee itself, a program was developed in which six different agencies agreed to perform definite actions in carrying out this general objective. For example, the Agricultural Adjustment Administration cooperated by not allowing low-grade sod lands to come into the AAA program as cropland, and also encouraged retirement and reseeding of low-grade wheat lands. The Farm Security Administration cooperated in accomplishing the common objective by getting its clients to take the poor land out of wheat and keep it in grass. The Farm Credit Administration cooperated by testing the feasibility of loans which would permit enlargement of too small units. Land productivity was to be considered carefully before extending loans so as not to encourage farming submarginal lands. The Montana State Land Department cooperated by discouraging wheat growing on submarginal land it controls, and encouraged reseeding by lowering rental charges to renters who reseeded such land. The Forest Service related the use and management of the National Forest lands more closely to the use of other lands and local needs for services and products from the forest, and cooperated in the replanting of burned areas, the transplanting, protecting, and propagating of beavers, and the control of rodents and weeds. Teton County officials cooperated by completing their reclassification of land in the county for assessment purposes, using the latter information to determine assessment values; assessing at a higher rate low-grade lands cultivated or broken up for cropping; giving a grazing classification to low-grade plow lands in sod or abandoned and assessing them accordingly; and making every effort to correct misuse of low-grade county-owned lands.[29]

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[28] There were 70,000 farm men and women members of organized county and community planning committees during 1939–1940, approximately 19,000 being members of county committees and nearly 51,000 members of the more than 6800 community committees. It has been estimated that more than 200,000 farmers, in addition to these members of county and community planning committees, took part in open community planning meetings during the six months ending December 31, 1939. (See U. S. Department of Agriculture, "Land Use Planning Under Way," pp. 10–11.)

Results obtained by methods similar to those used in Teton County have been secured in numerous other counties throughout the nation where unified land use planning programs have been undertaken.[30] One of the most important needs is the fitting of agricultural programs to local conditions and to each other; and experience with county agricultural land use planning thus far shows that this is accomplished largely through the coordination process. For example, highway agencies have been quick to utilize land use plans as guides for their farm-to-market road programs; and guidance in placing new schools and locating Rural Electrification Administration lines are other examples of uses growing out of important functions served by land use plans.[31]

The cooperative planning process has also been valuable in vitalizing research and educational programs of state and local agencies. For example, the agricultural experiment stations find a ready market for use and application of their research findings on specific problems in different areas, and a demand, backed up by strong local and state support, for more intensive investigation and research on numerous problems. In many states, this has improved appreciably the general quality and significance of the agricultural research program. In the case of extension work and adult education programs, special committees have been established in a number of agricultural colleges to help redirect extension activities in the light of land use plans developed in the counties, and the county agricultural extension agents are participating regularly with the county and community committeees in the development of extension programs which fit objectives developed through cooperative land use planning. The community meetings are highly educational, and the planning process itself is an educational experience for those who engage in it.

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[29] See "An Agricultural Policy for Teton County," prepared by community and county agricultural planning committees, July 1939 (mimeographed). See also "A Unified Agricultural Plan: Teton County, Montana," prepared by community and county committees with the assistance of action agencies, January 1940; and E. A. Foster and H. A. Vogel, "Cooperative Land Use Planning—A New Development in Democracy," U. S. Department of Agriculture, *Yearbook*, 1940, p. 1149; and "Land Use Planning Under Way," pp. 21 ff.

[30] Accomplishments of planning in several other counties are mentioned in some detail in "Land Use Planning Under Way," pp. 30 ff.; and in Foster and Vogel: *op. cit.*, pp. 1144 ff. These examples all point out how agricultural land use planning brings farmers and agencies together through common goals, and how they operate as a team in achieving objectives of harmonious adjustments of land use in interests of the general welfare.

[31] Foster and Vogel, *op. cit.*, pp. 1149–1150.

Problems Encountered in County Agricultural Planning. The effects of cooperation in agricultural land use planning frequently show themselves in the tangible cooperative activities of farmers themselves. For example, in some counties the work of planning committees has led to the establishment of cooperative sawmills, group purchasing of farm supplies and livestock, cooperative marketing, and other cooperative endeavors.[32] There are, of course, numerous problems involved in securing effective agricultural land use planning, and in the weaker counties where agricultural leadership is lacking or the general economic and social level of the people is very low, the planning program has in many cases not been very effective. It is not easy to achieve the degree of cooperation necessary to make effective coordination possible. Jealousy and antagonism between various communities or types of agriculture may result in refusal to cooperate to the degree necessary for the development of strong county planning committees and desirable unified agricultural programs.

In some areas, individuals in key positions have used the planning movement for their own individual advancement or for political purposes, and little effective land use planning and coordination has resulted. In others, a few individuals, not understanding the true character of over-all planning, have dominated the committees so that only a very limited number of persons or communities have participated effectively in the program, or received benefits from it. In many cases the lower socio-economic elements were not adequately represented.[33] In others, local vested interests have prevented or discouraged planning committees from taking an active stand or making specific recommendations concerning some of their more important or acute problems. In spite of these problems, which are very real in certain instances, the program has been successful in most counties. Farmers as a whole have become more conscious of the need for cooperation and for group discussion and thinking on agricultural problems. They have had to work increasingly with government agencies, and have had to use scientific knowledge to be successful. Broadening vision and increased leadership have made farmers more competent to deal effectively with their problems, and more able to come to an agreement on what is to be done, and how it is to be done.

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[32] *Ibid.*, p. 1151.

[33] Gross argues that the county planning program was not actually representative of the rural population of the area and consequently did not represent a virile and democratic process. He supports this proposition with three arguments: "(1) County planning represented only a part of the county; (2) the method of initial organization represented an undemocratic process; and (3) the lower socio-economic groups were not adequately represented." Gross, *op. cit.*, pp. 653–657.

Planning by counties and communities, however, cannot solve larger agricultural programs like price parity, expansion of foreign market outlets, and domestic balancing of supply and demand for farm products. Obviously, some of the broader planning must be done by state land use committees, state legislatures, the federal departments, agencies, and Congress, and through international cooperation and understanding. However, strong unified communities contribute to unification of counties; and this in turn makes for a stronger state and region, a stronger national government, and a better world order. Though all farm problems cannot be solved by local action, mere discussion of the broader considerations involved gives farmers a better basis for planning operations, and helps, in the aggregate, to influence state and national agricultural policies.

Next Steps Ahead. The accomplishments of county agricultural land use planning prove that planning can be an effective method of bringing about necessary and desired coordination of programs dealing with the utilization of land resources. However, these accomplishments are limited largely to agricultural lands, and even in the case of agricultural lands planning was undertaken on a broad scale for such a short period that it is impossible to appraise its possibilities fairly. Planning developments are needed for coordinating programs and practices involved in utilizing other types of land. Planning procedures on the community and county levels, tied in with state planning committees and federal agencies, should be undertaken for urban, forest, mineral, transportation, and recreational lands. When this has been accomplished, the groundwork will have been laid for that effective over-all land use planning on the community and county level which is so necessary for most efficient utilization of the nation's natural resources.

Obviously, there should be some central federal agency with which state, county, and community planning agencies could effectively implement their programs. At present, several state planning boards have been established, but the failure of many of these to survive has been partially due to lack of interest in communities and counties to make the work of such state boards effective and significant. In many cases, organization of state boards was premature, and efforts should have been concentrated upon establishment of local planning rather than on attempts to bring about planning from the top down. The uncertainty of the Second World War period, however, diverted attention in many areas from some of the longer-time and less dramatic land use adjustments which should be made. The fact that county agricultural land use planning was in extensive operation for such a short time may mean that its roots are not thoroughly established and that in many counties where preparatory or intensive work has been done, or even in some counties where unified programs have been developed, the work will suffer and interest will wane. The next few years will decide the effectiveness of this work, and determine whether democratic planning on an over-all basis in the interests of the general welfare can survive the stresses of the postwar period.

No doubt, as planning work proceeds, local committees will be forced to consider more carefully the ways in which their goals or objectives may be achieved. The question of private or governmental action will no doubt be important. However, those most closely associated with the land use planning program believe it entirely logical that cooperative planning may make its greatest contribution by "helping people to help themselves" through private action, rather than by mere coordination and unification of the programs of governmental agencies.[34] Obviously, achievement of many of the goals and objectives which will undoubtedly be set up will require combined private and public action. However, the possibility that private action alone may be able to deal with many problems of our modern world presents a major challenge to planning committees. Prophesying is dangerous; but students of planning hope that the land use planning process will develop individual initiative and increased participation in cooperative procedures among farm and other groups to deal with many difficult problems.

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[34] Foster and Vogel, *op. cit.*, p. 1155.

For example, in the case of agriculture, they hope that a great increase in cooperative endeavor will enable farmers to deal effectively through private action with agricultural surpluses, submarginal croplands, resettlement, creation of opportunities for farm youth, and related problems. In any case, according to these planners, "Cooperative planning holds the major hope of developing measures of private-public cooperation that will keep the public cost within reasonable balance and aid in balancing both public and private budgets."[35]

It should be kept constantly in mind that the purpose of all planning and social control of land use can be summed up in a single aim—a better life, attained through sounder land use practices and better adjustment of institutions and man-land relationships. Obviously, more than the machinery of democratic planning is needed for the achievement of a better life. Beyond economics, beyond politics, beyond material satisfactions, must be ". . . some motivating force or driving quality, a social conscience or a common morality, a sense of social solidarity or a consciousness of kins, a spirit of social service or *noblesse oblige*, some spiritual force or a finer faith . . . to animate the hearts and minds of men."[36]

Whether such a common faith can be developed and maintained remains to be seen. Many people feel that the present decade represents the climax of an epoch, and that we are entering a new order which will usher in new institutions, new habits of thought, reconsideration of values, and new ways of living. Enlightened people of the twentieth century are coming to regard the non-use or abuse of natural and human resources—idle land, idle machines, and idle men—as the greatest sin against nature and the greatest crime against society. The best use of resources may call for different forms of ownership and economic organization in accordance with different technical and social conditions.[37] Only the future will reveal the paths to be taken by our modern societies in attaining their objective of improved human living, but encouragement of democratic planning through community and group cooperation, with the purpose of coordinating and ultimately integrating resource use, certainly offers definite possibilities of accomplishing these necessary changes most equitably and satisfactorily.

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[35] *Ibid.*, p. 1156.

[36] G. B. Galloway *et al.*, *Planning for America*, p. 667. See also M. L. Wilson, "Beyond Economics," and W. E. Hocking, "A Philosophy of Life for the American Farmer and Others," in U. S. Department of Agriculture, *Yearbook*, 1940, pp. 922–937 and pp. 1056–1071.

[37] Lorwin believes the coming decades are likely to see an increasing impatience with economic and social impediments in the use of resources, and that this is bound to have a profound effect on ideas of property and of economic organization. He also warns that experience may show that some forms of public enterprise and public monopoly may be no better than private enterprise in its monopolistic forms which has been attacked as the main hindrance to productive efficiency (Lewis L. Lorwin, *Time for Planning*, p. 257.)

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